

# PHOBI

Combating stage fright through  
a virtual reality game



Master of Arts Thesis by **Gautam Vishwanath**

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# Abstract

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Stage fright is often considered to be the most feared fear in the western world. Therapeutic treatments that make use of virtual reality have been successful at alleviating stage fright. This is because virtual reality possesses the ability to simulate an artificial environment that allows its users to feel as if they are on a stage. However, many of these treatments are expensive and not easily accessible to an average person. On the other hand, virtual reality games are easier to download while also helping their players practice and motivate them to overcome their obstacles. Using this approach, I am designing a virtual reality game titled Phobi, that is aimed at alleviating stage fright and improving its players' public speaking skills. Phobi makes use of design guidelines that are established over the course of this research. Eventually, Phobi is tested out with a set of participants and its advantages as well as limitations are discerned.

**Keywords:** stage fright, virtual reality, presence, game, humour, speech.





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**Aalto University**

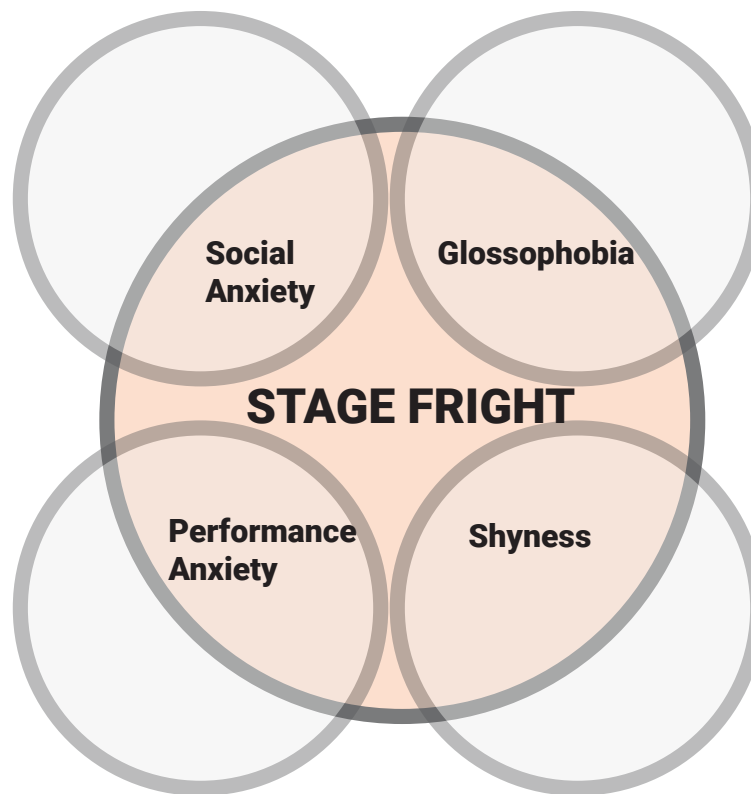
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# A note on terminologies



*Fig 1. The application of the term 'stage fright' for the scope of this thesis.*

## Stage fright

In this thesis, the application of stage fright as a term includes a much broader spectrum and degree of this particular fear. It literally refers to going up on a stage and presenting in front of people who form an audience or a crowd. The fears range between minor performance anxieties all the way to extreme cases of Glossophobia, i.e. fear of public speaking.

The application of the term stage fright roughly encompasses public speaking, speech disorders prior to being on stage, performance anxiety, social anxiety, and a moderate extent of shyness.

## **AI**

Artificial Intelligence.

## **Avatar**

A figure or character representing the player inside a VR game.

## **FOV**

Field of View.

## **Game**

An activity played using mechanics within a set of rules and geared towards a goal.

## **HMD**

A device containing a screen worn on the head for viewing 360° simulations.

## **IVET**

In-Vivo Exposure Therapy - Explained in Pg 39.

## **Level**

A section or a part of a game.

## **Performance**

The measure of achievement when a player is caught in the act of presenting.

## **PI**

Place Illusion - Explained in Pg 35.

## **Player**

Any user of a digital game who participates in the game environment by applying their mechanics.

## **PSI**

Plausibility Illusion - Explained in Pg 35.

## **VB**

Virtual Body - Explained in Pg 36.

## **VHB**

Virtual Human Behaviour - Explained in Pg 36.

## **VR**

Virtual Reality: An artificial immersive environment experienced through sensory stimuli by wearing a Head Mounted Device (HMD) and moving one's body.

## **VRET**

Virtual Reality Exposure Therapy - Explained in Pg 39.

## **User**

A person experiencing a VR simulation.



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# 1

## INTRODUCTION

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I am afraid! Afraid of heights, afraid of insects, and most of the time afraid to speak in front of a crowd. Being a VR enthusiast and having examined its relative success in treating phobias, it provided me with the idea of creating a VR game that would treat my own fears in a simulated environment. Not only would this approach be fun, but the game could also serve as an antidote to other people as well.

Stage fright is a fear that appears to sufferers when they perform a speech or a presentation in front of other people. An average person in the western world encounters public speaking much more often when compared to other fears, such as insects or activities related to heights (Chapman Survey of American Fears: Wave 1, 2014; Tillfors et al., 2008). Hence, I chose stage fright as the most relevant fear amongst many others to work with. As a game designer, my aim is to create a VR game titled Phobi, wherein the game's players are able to safely encounter their stage fright in a simulated VR environment and gradually instil confidence within themselves. The design of Phobi is based on research conducted around stage fright, VR as an engaging tool, and games as interactive mediums.

# 1.1

## BACKGROUND

Fear is an integral part of all humans and many other organisms, and even the most courageous of us are afraid when we sense a threat. One of the most commonly encountered fear is stage fright. Interestingly, certain studies have hinted that an average person fears public speaking even more than death, and this is also increasingly relevant in modern times (Chapman Survey of American Fears: Wave 1, 2014; Dwyer & Davidson, 2012; Tillfors et al., 2008). There have been numerous attempts, techniques and tools established that target and seek to overcome stage fright. Yet, most of us continue to endure varying degrees of this fear.

One of the tools or mediums applied to overcome stage fright is by simulating the environment and audience in virtual reality (VR). During the last few years, VR devices have re-emerged with sharper technological fidelity and easier accessibility. These devices are capable of providing an overwhelming sense of fantasy and they sometimes allow their users to interact within this realm (Chirico, Ferrise, Cordella, & Gaggioli, 2018). Moreover, a well-designed VR experience is able to maintain a sense of presence for its users (Slater, 2009). Currently, VR has largely been successful when applied in psychological therapy due to the advantage it holds that enables the simulation of an artificial environment in which its users are safely able to engage (Anderson et al., 2013).



Some of these engaging modes of interaction in VR are games. Games are a form of play that is defined by rules, challenges, obstacles, and outcomes. A well-designed game provides an intrinsic motivation to solve quests, overcome problems, and earn rewards. It allows its players to immerse themselves in a ‘state of flow’ while momentarily forgetting about the reality outside the game’s realm (Csikszentmihalyi, 2002; McGonigal, 2011). One component of many digital games is humour; it holds the power to force a change in perspective and reinterpret fear. Through these methods, games have been very effective in various therapeutic treatments as well as alleviating stage fright (Göbl et al., 2015; Levy et al., 2016). Therefore, Phobi is destined to be very useful as a VR game that tackles stage fright.

Phobi is a VR game wherein its player stands on an artificial stage and performs in front of a simulated responsive audience. Here are some key features of Phobi’s gameplay:

- The performance in the game could be of any time, such as the player’s own presentation, or a stand-up comedy, or karaoke, or even a political speech.
- Phobi calculates the performer’s time limit, volume, pitch, tone, movement, and accuracy of speech as well as provides feedback based on these factors.
- The size of the audience within the game varies extensively. For example, the player begins in a small room delivering their performance only to a few people and the game gradually shifts to a large theatre composed of a crowd numbering thousands.

In this manner, Phobi attempts to enable its players to experience their own stage fright and gradually alleviate it. The players are also able to practice and improve their public speaking skills. Phobi could be experienced by players using their VR HMDs within the comfort of their own homes. The second prototype of Phobi can be downloaded for free here: <https://bit.ly/2G5THG4>

# 1.2

## Research goals

The previous section indicated that the combination of VR and games offers the potential to allow players to tackle their stage fright and engage in an environment of immersion and fun. These days, many VR users are capable of experiencing these types of simulations on their own devices without the presence of a therapeutic intervener. Therefore, a well-designed experience must also ensure that it is also safe to undergo. Furthermore, the advantage of easier accessibility of VR devices is that the users can freely practice being on an artificial stage on their own accord.

### Research questions

A therapeutic VR experience would be ideal when it is safe and friendly to its users. Moreover, the experience should be geared towards helping its users overcome their fears, which in this case is stage fright. It would also be favourable if the experience helps its users practice and become better each time they are on stage. Thus, the main research question of the thesis is:

**How can VR enable safe and accessible ways of experiencing stage fright as well as alleviate the condition by improving public speaking skills?**

This question will be answered by predominantly examining its main elements, namely:

**1. Stage fright**

**2. VR**

As a game designer, I strongly believe that games possess the ability to solve various problems. In order to measure this ability, this thesis studies games as an approach to tackling stage fright through VR.

Each one of the elements and the relationships between each of them are thoroughly investigated in the following chapters. Through the course of this research, a set of design guidelines are established for the creation of Phobi. These guidelines are created based on the second research question of the thesis:

**What kind of features could be used in a virtual reality game that seeks to alleviate stage fright and improve its player's speaking skills?**

Towards the end of the thesis process, Phobi is tested with a focused group of players who experience symptoms of stage fright to varying degrees. After testing, the overall impact of Phobi and the research questions are assessed through semi-structured interviews with the players. Based on these tests, the conclusions, limitations, and future outlook to the game are outlined.

## Research methods

This thesis is a production-based thesis that involves a component of research and production. These two components are used for the creation of Phobi as a VR game. The flow of the entire process of development leading to the conclusion is as follows:

- Literature reviews are conducted in order to investigate the key elements of the main research question, namely stage fright and VR. Stage fright is understood through its origins and methods that are commonly applied to counter it. Additionally, therapeutic VR methodologies and mainstream VR applications that aim to combat stage fright are thoroughly examined. Finally, the literature review also delves into games that aim to tackle stage fright.
- Production-based research involves the adoption of generative research methodology in order to find solutions to situated problems (Seliger & Young-ae, 2015, p.24). In this thesis, the literature review is the main generative research methodology. Parts of these research findings from the literature review are applied to improve Phobi by creating certain design guidelines as frameworks that direct the process of development.
- Phobi is tested out with a set of participants after its second prototype has been developed. Their experience is assessed based on their nature of interaction within the game. After testing the prototype, semi-structured interviews are conducted with these participants, and the questions asked are based on the findings of both the research questions. The advantage of these interviews being semi-structured is that they allow the interviewees to divert from the main topic and provide new ideas. Through the participants' responses and ideas provided by them, the answers to both the research questions are examined further.

All of the steps mentioned above draw conclusions to the whole thesis and suggest potential future enhancements for Phobi. The next section provides an outline to all the chapters in this thesis.

# 1.3

## Outline

The production of Phobi as a game is based on research related to stage fright, VR, and games. Therefore, this thesis is categorised according to the research and documentation of the production process. Each one of the next three chapters is oriented on the elements of the main research question, namely fear, VR, and games. These two chapters also include a literature review on the chapter topic. Chapter 4 focuses on the second research question by describing the design guidelines and the main production process. The last two chapters outline the highlights of Phobi's production, limitations within its design, the future outlook, and culminate with conclusions to both the research questions of this thesis.

Chapter 2 begins with the idea of stage fright as the most feared fear. Stage fright is examined by delving into its relevance in the modern era, its evolutionary roots, symptoms, and methods that are commonly undertaken to confront it. One method to alleviate stage fright is by simulating an artificial stage with audience in VR. The mechanisms behind the ability of VR to 'suspend disbelief' such as immersion, presence, and coherence, are examined. Eventually, this chapter explores VR based researches and mainstream accessible applications that tackle stage fright.

Chapter 3 provides a close look at games by delving into its constituents. It also examines the effectiveness of games in tackling problems and creating engaging experiences. In addition, this chapter investigates the use of humour in games and asserts



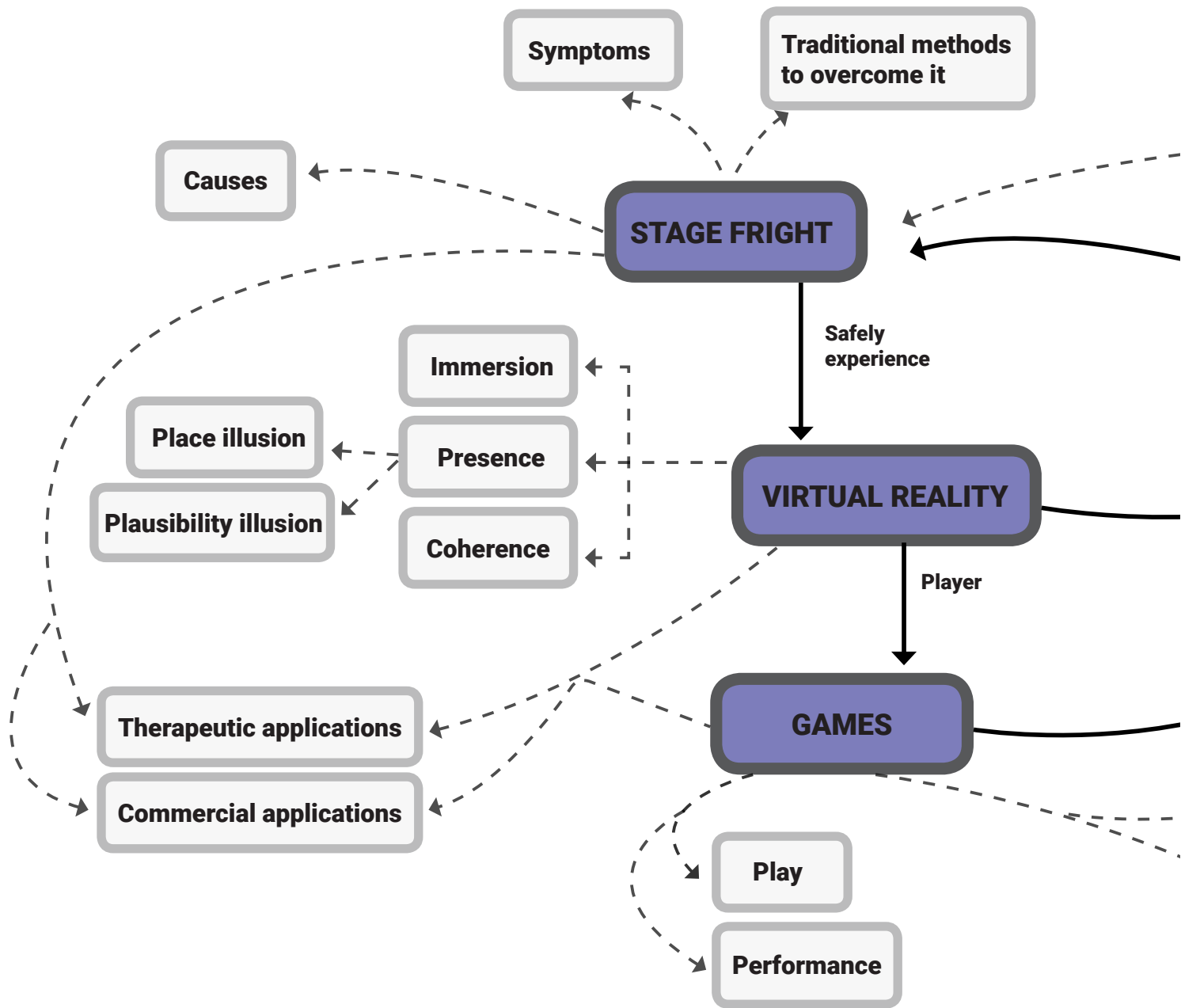
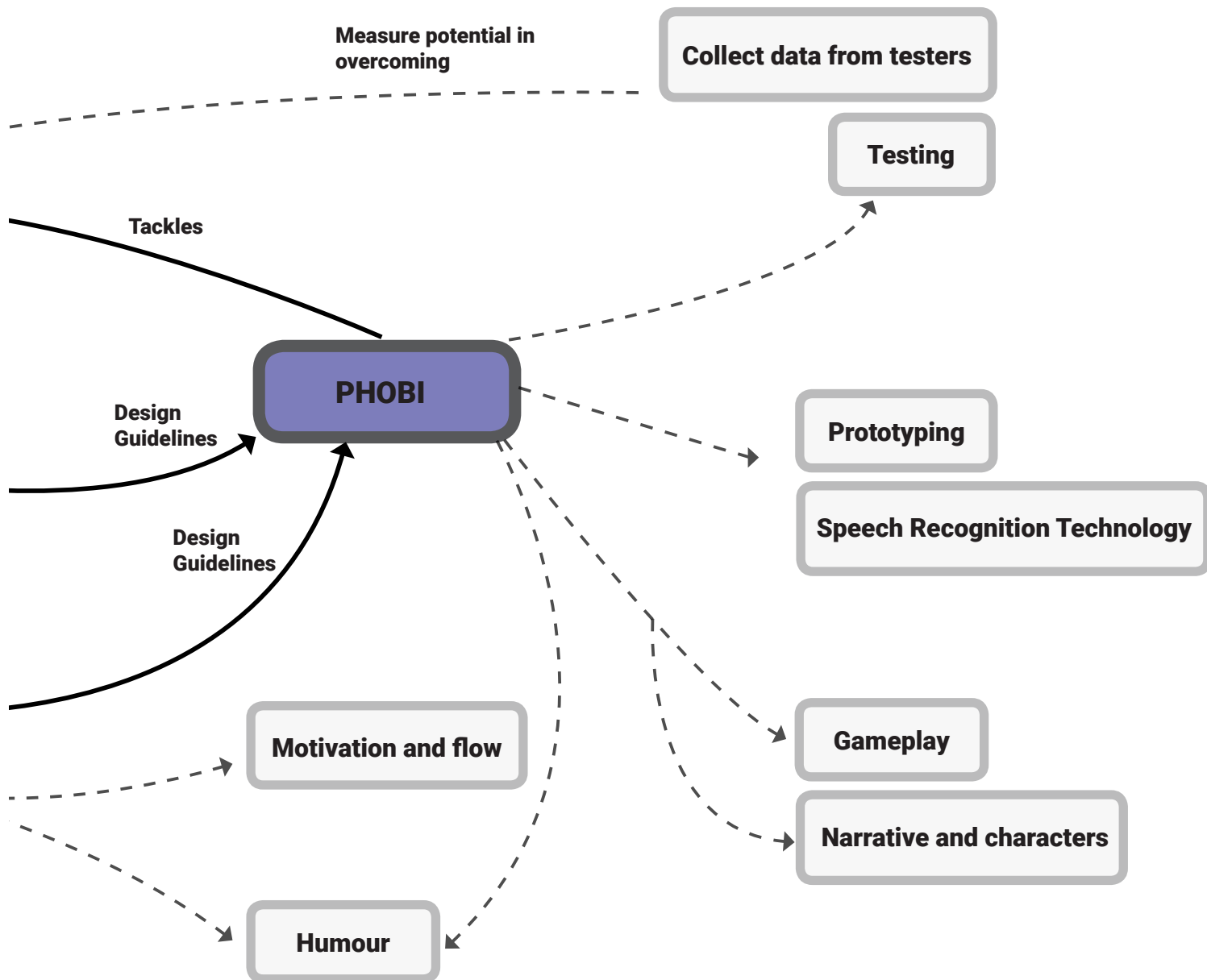


Fig 2. A system map that summarizes the flow of the entire thesis process.

its value in aiding a therapeutic process. At the end of the chapter, existing VR games that tackle stage fright are reviewed and compared with non-game VR applications.

Chapter 4 outlines certain design principles that are implemented during the creation of Phobi as a game. The process of creation of Phobi's prototype and all the main decisions determining the content are documented. This chapter delves into the details of all the features within Phobi. Eventually, the prototype is tested amongst a few partic-



ipants. The test results are analysed by conducting semi-structured interviews with these participants.

Chapter 5 provides a brief reflection on the entire process of research and development. Through these reflections, some of the key limitations of Phobi are uncovered. Future enhancements to the game are provided based on the limitations and tests conducted earlier. Lastly, Chapter 6 draws conclusions to both the thesis questions.

# 2

## STAGE FRIGHT AND VIRTUAL REALITY

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In order to understand stage fright clearly, it is necessary to comprehend fear in a broader sense. A simple definition of fear states that it is the **feeling induced when the brain perceives a threat to the body** (Fernandes et al., 2013). This feeling is prevalent not only within humans but many other organisms as well. The usual response triggered by fear is ‘flight-or-fight’, i.e either getting away from the stimulus or confronting it (“Fear,” 2019). This response holds true for stage fright as well (Dave Guin & TEDx Talks, 2015).

## 2.1

# The most feared fear

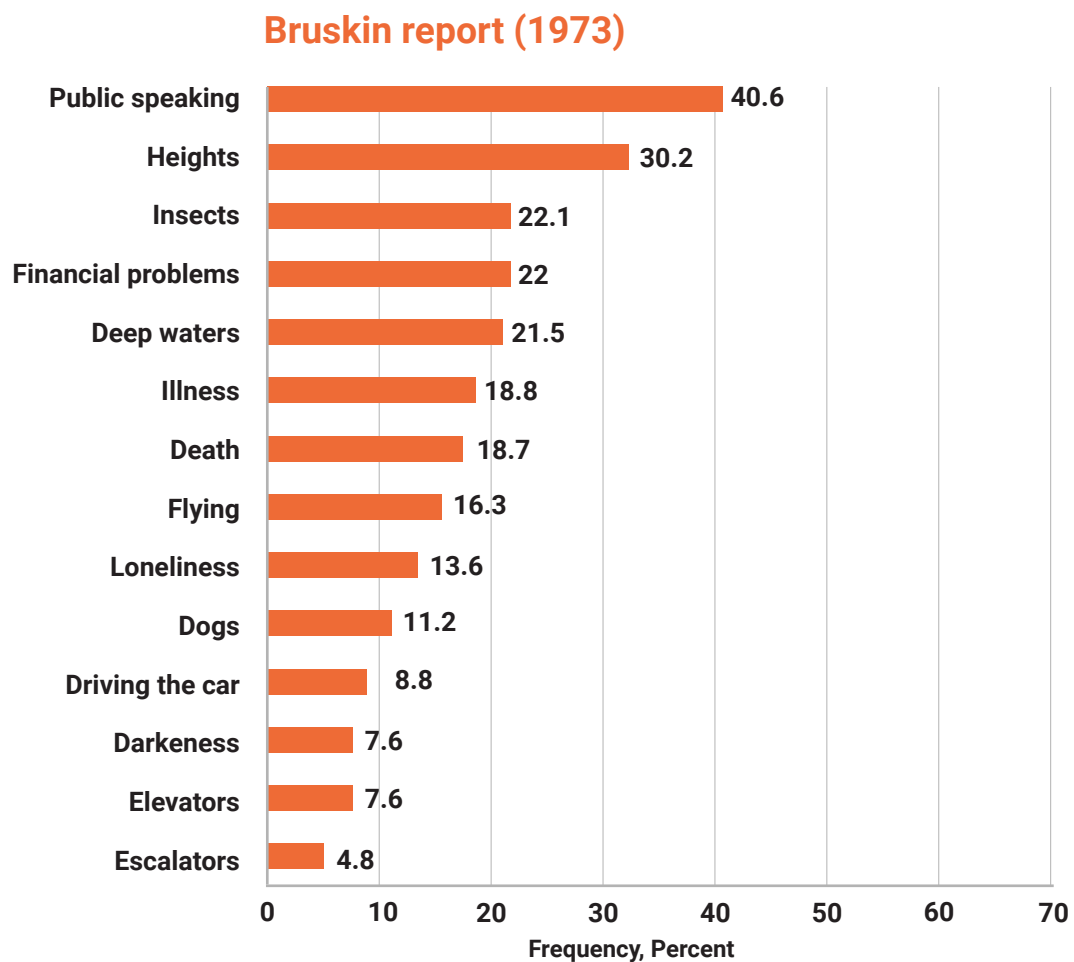
A famous quote from the comedian Jerry Seinfeld aptly highlights most people’s worst fear in a humorous way (Cherones, 1993):

According to most studies, people’s number one fear is public speaking. Number two is death. Death is number two. Does that sound right? This means to the average person, if you go to a funeral, you’re better off in the casket than doing the eulogy.

Not only is this joke funny, but research into stage fright through polls conducted has also proven that the quote is somewhat accurate, and some of these cases are outlined in the next subsection.

## Statistics

The most cited survey related to stage fright is the Bruskin report from 1973. It revealed that 40.6% of Americans suffered from the fear of public speaking, considerably higher than the fear of death, which was 18.7% (Bruskin Associates, 1973). Dwyer and Davidson (2012) re-examined this notion by scrutinizing Bruskin's survey and validating its findings for the present day and age. Once again, respondents ranked stage fright highest, at 61.7%, and this was true for both the genders (Dwyer & Davidson, 2012). In addition, a recent survey conducted by Chapman University (2014) indicated that stage fright was the biggest phobia, with 26.6% of the respondents claiming to suffer from it (Chapman Survey of American Fears: Wave 1, 2014).



*Fig 3. The Bruskin report*



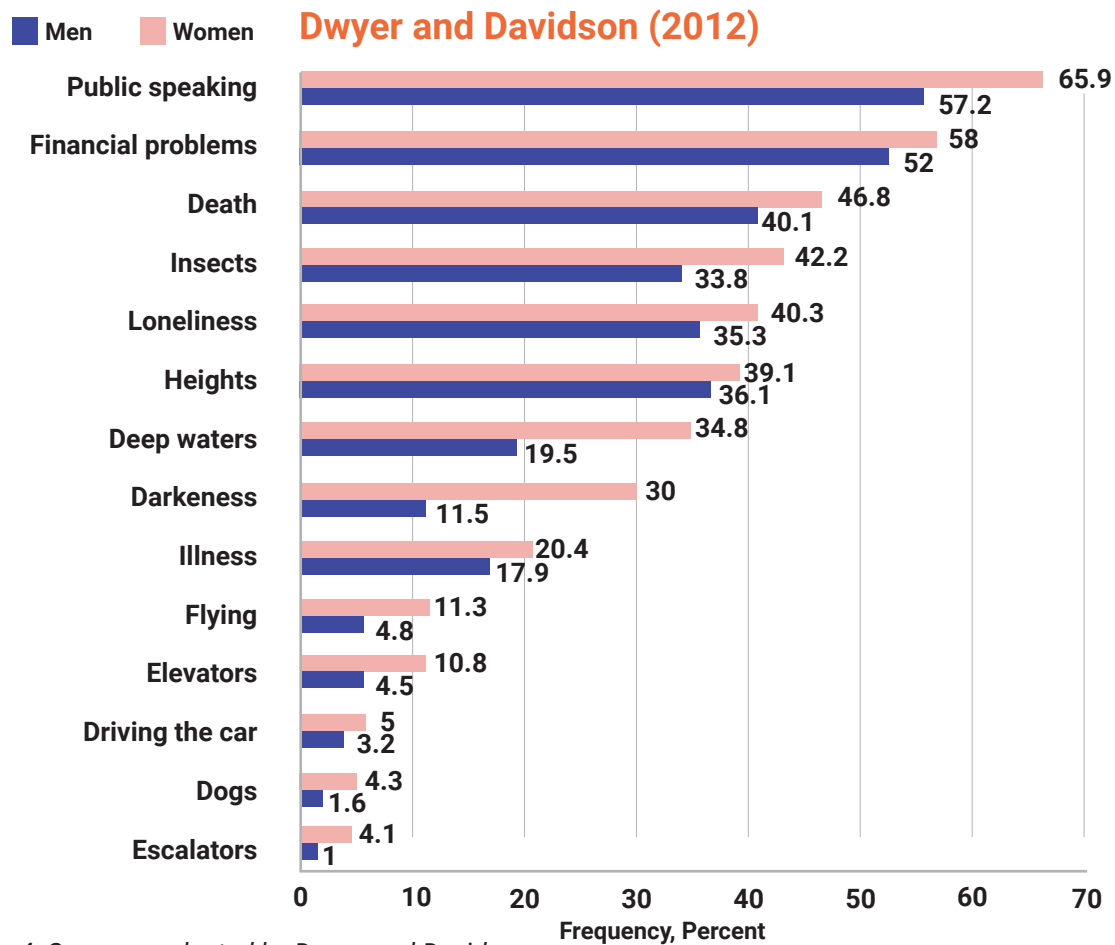


Fig 4. Survey conducted by Dwyer and Davidson

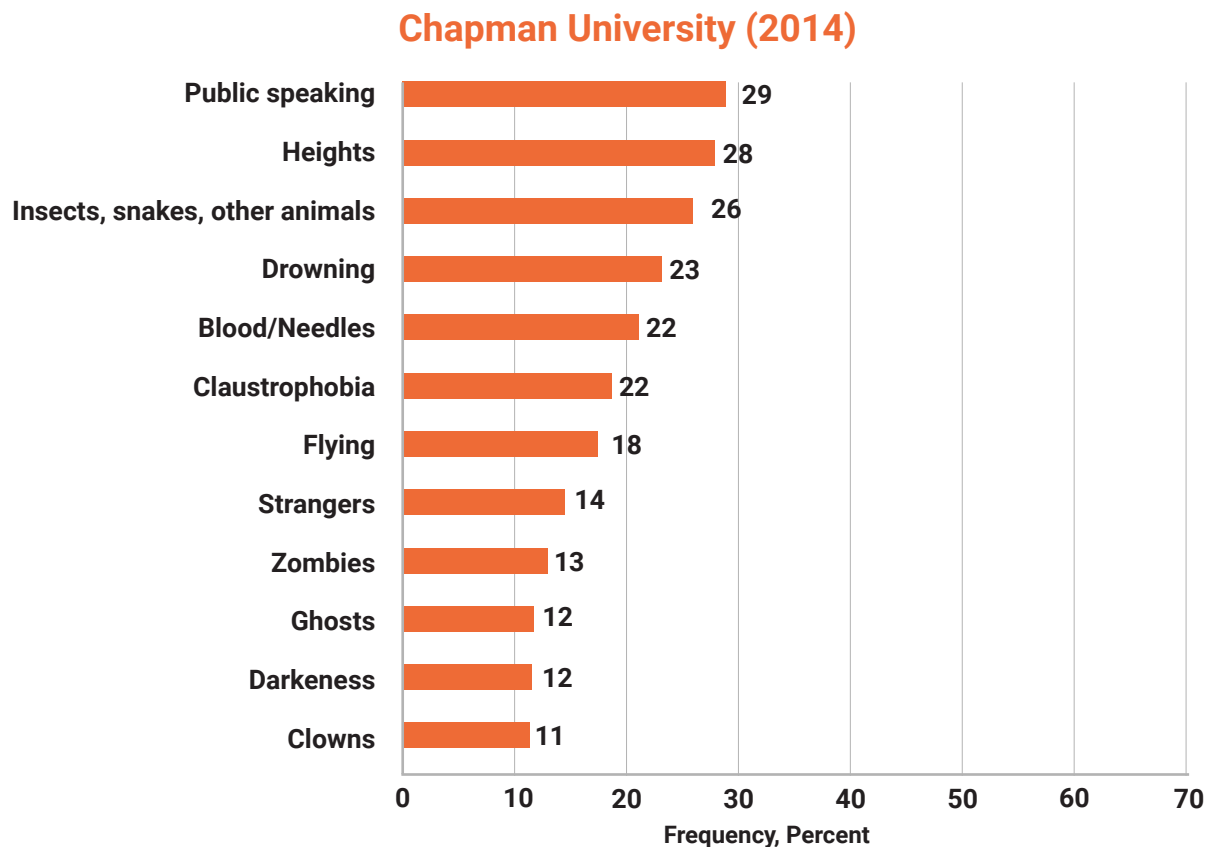
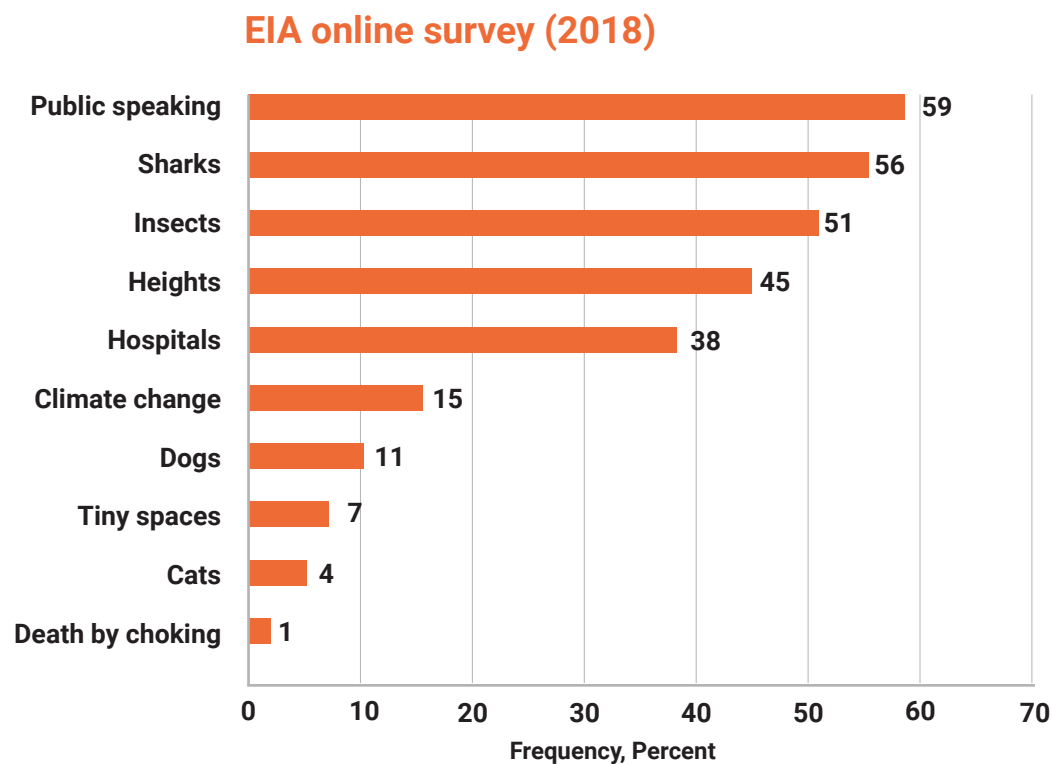


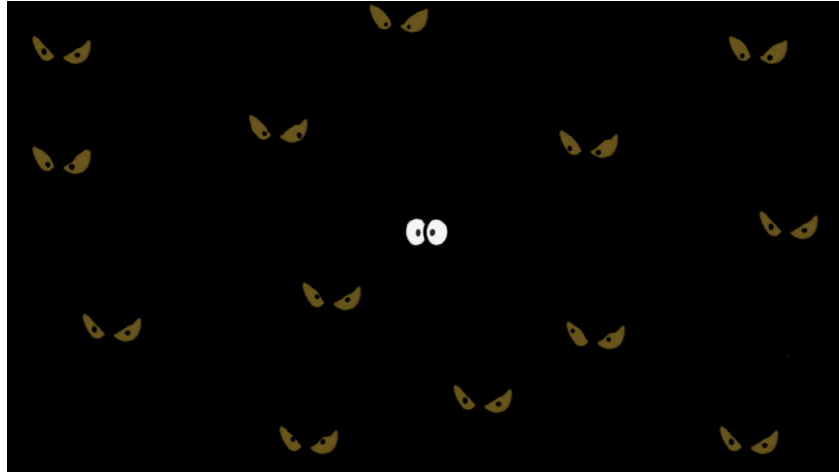
Fig 5. Survey conducted by Chapman University

These reports draw very similar conclusions regarding stage fright being the top most encountered fear. However, they have also been criticized as being inaccurate or exaggerated (Berkun, 2009). Therefore, in order to validate it further as well as check whether the most feared fear is a universal phenomenon or merely an American one, our team at the European Innovation Academy (EIA) conducted an online survey while researching Phobi's potential effect in the market. The respondents came from a diverse range of countries, with the majority drawn from Finland, Chile, India, and China. Once again, it resulted in similar findings, with 59 out of 163 or 36.2% of respondents highlighted stage fright as their primary fear. This was slightly more than the fear of sharks and insects, which were mentioned by 35% and 30% of respondents respectively. The survey results are highlighted in Fig 6.



*Fig 6. The survey conducted at the European Innovation Academy*

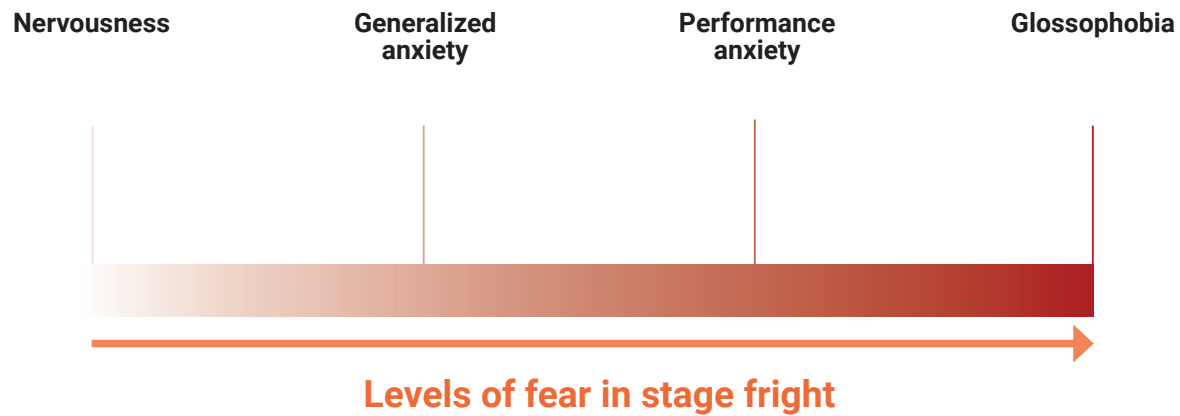
These days, people in metropolitan circles are noticeably engaging in public speaking much more often (Wrench, 2011). Nevertheless, stage fright continues to haunt many people (Dwyer & Davidson, 2012). Having briefly discussed the data from the surveys, the reasoning behind these results requires further analysis.



*Fig 7. Stage fright originates from the fear of the unknown, as mentioned by Dave Guin*

## Causes

After examining the past and the evolutionary roots of stage fright, this thesis uncovered some intriguing explanations. In his explanation, Prof. Dave Guin (2015) traces stage fright back hundreds of thousands of years to when human beings were merely hunter-gatherers and foragers (Dave Guin & TEDx Talks, 2015). During this era, humans encountered countless threats, such as extreme weather, predators and other rival human beings. Moreover, after nightfall, there were hardly any other sources of light with the exception of fire. Exposed to severe cold and rain, a person would take shelter within deep and dark caves. This brought them within the range of other predators, which they were unable to see in the darkness. Those that confronted larger predators and attempted to fight them mostly perished and hence did not reproduce. While others that fled were often successful and managed to pass down these traits in their genes. Over the course of many millennia, this flight response has been genetically imbibed within all of us, even to this day. Hence, even when the rational mind clearly understands that there is no potential threat to be faced by going up on stage, the evolutionary side of it fears the unknown and automatically triggers such a response (Dave Guin & TEDx Talks, 2015). Other studies have drawn very similar conclusions regarding the evolutionary roots behind fear as well as stage fright (Barrett, 2015; Marks & Nesse, 1994). There have been very few studies that have researched specific evolutionary causes regarding stage fright, and more knowledge is necessary.



*Fig 8. The levels of fear in stage fright*

In addition to the evolutionary mechanism, there are many other factors that play a part in contributing to stage fright. Some of them include the fear of ostracism, lack of confidence or low self-esteem (Ayres, 1986). These causes could be coupled by a mild tinge of narcissism wherein the focus ends up being so much on the role of being a presenter and very little about the engagement with an audience (Gabbard, 1983). Extreme cases leading to stage fright also include childhood trauma, autism, and post traumatic stress disorder (PTSD) (Tull, 2018). Therefore, stage fright is very subjective and there are various reasons that lead to it.

The lack of preparation is also a relevant cause of stage fright. Insufficient practice or preparation could exaggerate or amplify symptoms that result from the causes mentioned earlier (Nikitina, 2011). On the contrary, unlike evolutionary programming, preparation remains in the domain of a presenter's control (Nikitina, 2011). With better preparation, the evolutionary defence mechanism could gradually be neutralized. Preparation also eliminates the barriers of perception, instils confidence, and mitigates the fear of judgement. A VR simulation could serve as an ideal environment for its user to prepare on an artificial stage that mimics a real one. This is because the stage is not real, thereby making it much safer for presenters to experience a simulation without any real-life consequences, such as being judged by the audience.

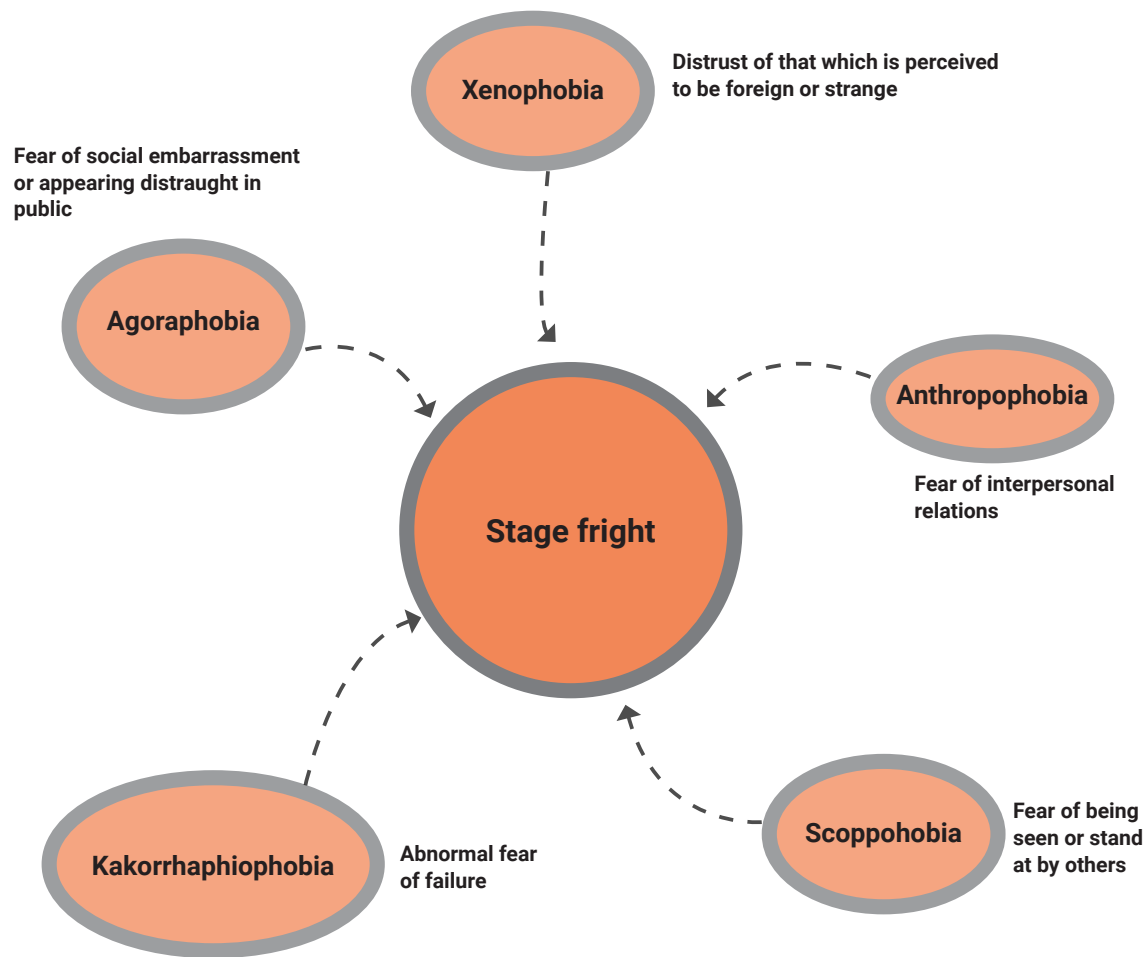


Fig 9. Other phobias that could contribute to stage fright

## Symptoms

The symptoms for stage fright could vary considerably depending on the time period before or during a presentation. To most people suffering from stage fright, low-level generalized anxiety takes effect many days or even weeks prior to the event (Steptoe et al., 1995). However, as the performance draws closer, many people could experience nervousness, stress, and queasiness. Minutes before the performance, presenters could

encounter rapid breathing, racing pulse, irritability, and palpitations. Extreme cases of stage fright tend to include vision changes, vomiting, and even gastrointestinal problems (Steptoe et al., 1995). Through frequent practice and developing greater experiences, a majority of presenters are likely to suffer less from the pre-stage symptoms (Nikitina, 2011). Some of these symptoms were noticeable even when presenters were undergoing low fidelity VR experiences, and this aspect is elaborated in the later sections (Pertaub, Slater, & Barker, 2002). The transitions between all the stages mentioned earlier are examined in Phobi as well.

## Alleviation

As reviewed earlier, preparation seemed to be an ideal method for tackling stage fright. Moreover, practice and experience by presenting often boosts confidence and reduces multiple anxieties. This crucial point has also been asserted by a few studies (Bishop, 2005; Munger, 1974).

The internet is replete with tips and methodologies for overcoming stage fright. These methods are far more accessible to an average person compared to heavily researched academic papers. In order to understand what an average presenter may come across while preparing, the top 5 remedial categories that uncovered include mind, body, lifestyle, audience, and preparation. Through these categories, the following table makes a comparison between the most trending websites:

	Preparation	Audience	Mind	Body	Lifestyle
<b>ADAA (Anxiety &amp; Depression Association of America) (n.d)</b>	Reading material aloud.	Maintaining eye contact.	Shifting focus to the content.	Maintaining a good posture.	Limiting caffeine, sugar, and alcohol.
<b>WikiHow (n.d)</b>	Reciting the words to your favourite song or poem.	Imagining your favourite person in the audience.	Meditating.	Laughing as much as possible.	Exercising, eating well, drinking juice.
<b>Genardmethod (2016)</b>		Greeting the audience and smiling.	Turning negative thoughts to positive, visualizing success.	Maintaining a posture, breathing, moving on stage.	
<b>HuffPost (2013)</b>	Practising in front of a mirror.	Remembering that it is not about oneself and more about the audience.	Being oneself and not a robot, talking to oneself, controlling negative thoughts.	Being sharp, breathing deeply, and stretching.	
<b>CNBC (2016)</b>	Wearing the exact clothes to be worn during the presentation and imagining the scene.	Understanding the specific audience and tailoring the speech to them.	Picturing oneself as a winner, being patient, don't overthink.	Breathing deeply before beginning.	
<b>Medium (2018)</b>	Practising and repeating.	Maintaining eye contact, being humorous and spontaneous.	Removing irrational thoughts, and rewiring the mindset.	Exercising, and applying power poses.	Making a habit to talk to strangers, finding a mentor, and learning a musical instrument.
<b>Lifhack (2014)</b>	Practising in front of family and friends.	Focusing attention on people listening.	Relaxing the mind, accepting and observing fears.	Exercising, and applying power poses.	Eating fruits, practising yoga.

Table 1. Different trending websites and their suggestions for alleviating stage fright.

Furthermore, it is very interesting to examine the relationship between profanity and stage fright. An interesting new research conducted by Stephens et al. (2018) hints that swearing or cursing could help a person perform better (Stephens, Spierer, & Katehis, 2018). Although this research does not target stage fright, in particular, it indicates that cursing leads to emotional arousal, which is often very important to a presenter prior to a public speech (Stephens, Spierer, & Katehis, 2018). Upon reviewing this study, Leland (2017) suggests that presenters could improve their performance by cursing before they begin (Leland, 2017). It would be intriguing to find out how this works with people who rarely or never engage in any form of profanity.

While some of these methods described earlier attempt to help presenters, stage fright continues to haunt many people. It is still reported as the single most fear amongst many others (Chapman Survey of American Fears: Wave 1, 2014). With the advent of new technologies such as VR, combating stage fright has gained relevance once again (Pertaub, Slater, & Barker, 2002). This is due to VR's ability to simulate an artificial environment similar to a stage and thereby create a strong sense of immersion. This type of simulation holds the potential to enable a VR user to focus and practice their presentation. VR applications such as *Virtual Speech* and *Speech Center VR*, have taken advantage of these abilities and offer enhanced tools. The novelty of VR as a medium and its application in combating stage fright are elaborated in the next two sections.

## 2.2

# Introducing virtual reality

Virtual reality (VR) is currently a trending topic within the technological and gaming arena. Upon wearing a VR Head Mounted Device (HMD) that contains an artificial simulation, a user of VR can visit computationally generated virtual planets, medieval castles, and combat with cyborgs; these fantasies are amongst an endless set of pos-



sibilities. During the 1980s and 1990s, VR used to be a tool of fantasy for storytellers and technology enthusiasts; however, it has now become very practical and accessible to more people (Caddy, 2017). It is also gradually being applied for therapeutic purposes and treating fears such as stage fright (Anderson et al., 2013). The next subsection discusses some of the mechanisms that enable VR to be an engaging medium.

## Mechanisms

Many designers of VR experiences focus on psychologically placing their users inside a different realm from where they are physically located. But what makes one VR experience more engaging compared to another? Are there any standards to measure it and if so, how could be assessed? These valuable questions require a thorough examination before designing any VR experience.

The academician Mel Slater, often considered to be the guru of VR research has proposed certain frameworks for evaluating a user's level of engagement in VR experiences (Slater, 2009). This section assesses some of his and other frameworks that enable VR to create such a powerful illusion, namely:

- a) Immersion
- b) Presence
- c) Coherence

### Immersion

When users experience a VR simulation, they often describe themselves as being 'immersed' inside the artificial environment. Because of the ability to simulate a 360° view, VR HMDs aim to provide higher degrees of immersion compared to traditional screens, such as computers or mobile phones. However, what does immersion actually entail?

Immersion is considered to be the degree to which a VR system provides users with an inclusive, extensive, vivid and interactive experience (Jerald, 2015; Slater, 2009).



*Fig 10. The HTC Vive contains controllers that makes it more interactive when compared to the Google Cardboard*

Within the scope of this thesis,

- Inclusiveness refers to the degree to which the physical reality is removed.
- Extensiveness is the range of sensory modalities experienced by the user, such as the visuals, audio, and tangible entities.
- Vividness includes the extent of technological fidelity, such as resolution, frame-rate, audio bit-rate.
- Interactivity is the ability of the users to bring in their own inputs and actions that affect the simulation.

For example, compared to Google Cardboard, Vive is the more immersive of the two VR HMDs because the Vive is:

- More isolating and ergonomic due to a lesser strain on the head, thereby being more inclusive.
- Has controllers to extend the user's interaction with their own hands, thus accommodating more sensory modalities.
- Projects clearer visuals and audio that makes it more extensive.
- Higher in resolution, frame rate, and field of view (FOV) that creates more vividness.
- Allowing room-scale projections that assist the user's locomotion within a defined physical space.

As discussed earlier, immersion is assessed through objective measurements, such as the technical specifications, fidelity, and other extensive possibilities of the HMD. However, such assessments commonly fail to take into account users' subjective interpretations of VR experiences. These types of interpretations could be described by a user's sense of presence in a simulation.

## Presence

VR is capable of producing a visceral feeling of being inside an artificially simulated environment; this feeling varies across different users. Within VR, the **subjective degree of immersion different users experience towards the same simulation is called presence** (Jerald, 2015). It is an internal psychological state, providing a sense of 'being there' inside a simulated 'space' even though the user might be physically present in a completely different location (Slater, 2009). Hence, presence is fundamental to the success of a VR experience.

Returning to the topic of immersion, the user could be completely immersed inside the simulation while momentarily forgetting about the physical reality outside. By contrast, the user could also be partially immersed while recognizing the state of reality existing outside the realm of the virtual experience. However, even while the level of immersion of an HMD is low, it is still possible to maintain a sense of presence by tweaking the design of an experience to fit it within the boundaries of immersion. Presence could be broken down to two components, namely Place illusion (PI) and Plausibility illusion (PSI) (Slater, 2009). These components directly contribute to and define a user's sense of presence.

The virtual place inside an experience is one of the most critical aspects of immersion and the creation of presence. In his study, Slater (2009) defines PI as "[t]he strong illusion of being in a place in spite of the sure knowledge that you are not there" (Slater, 2009). It deals with how the world is perceived. Ultimately, the inclusiveness, extensiveness, vividness, and interactivity of an HMD serve as boundaries for PI. Consider an example of a user standing on a virtual stage and experiencing an audience in front of them. As the user moves closer to the audience, they appear to be closer as well. The environment is being perceived the way the user would expect it to be, and this is the PI.

If the PI deals with the space in the virtual environment and how it is perceived, the Plausibility Illusion (PSI) focuses on what is being perceived or the contents of the environment. As Slater affirms, PSI is the illusion that what is happening in the simulation is really happening despite the user being entirely sure that it is not (Slater, 2009). Consider a similar example of the user on a virtual stage with an audience. Let us suppose the user asks an audience member a question and receives a response immediately. This response is an event over which the user has no direct control, but it directly relates to the user's action as well as expectation. Ultimately, this is the PSI. It could be asserted that the more coherent an experience is, the stronger the PSI.

## Coherence

The coherence establishes a context and a set of rules within the simulation, thus defining the validity of the experience. The validity is checked by whether the content of the experience makes sense for the environment it is taking place in.

Building on Mel Slater's framework, Skarbez et al's (2017) study establishes four factors that aid coherence in a VR scenario, namely:

- Virtual Human Behaviour (VHB): Identifying how other humans behave. In a similar manner, this could possibly be applied to other humanoid characters and creatures.
- Virtual Body (VB): The behaviour of the user's body, assessing how realistic or believable it is. In this thesis, the use of the term VB is synonymous with the term 'avatar', if the avatar is a figure. In case the avatar is a character representing the player, then the VB is considered to be a part of the avatar.
- Physical Interactions (P): Checking whether the physical interactions are intuitive and match the user's expectations.
- Scenario (S): Evaluating whether the scene or the environment is coherent with the situation taking place.

The study (2017) concluded that the context of a simulation is crucial in determining how engaging the content is; therefore, coherence determines the PSI of a VR experience (Skarbez, Neyret, Brooks, Slater, & Whitton, 2017).

In order to validate this phenomenon, Skarbez et al (2017) conducted an experiment, wherein participants experienced a VR scenario and were provided with a choice of  
In order to validate this phenomenon, Skarbez et al (2017) conducted an experiment,



Fig 11. An example from Skarbez's experiment indicating that the coherence drops due to a mismatched scenario (S) (Skarbez, Neyret, Brooks, Slater, & Whitton, 2017). In this case, the floor, walls, and ceiling are completely incoherent in comparison to the people.

wherein participants experienced a VR scenario and were provided with a choice of upgrading these factors at different stages with further enhancements (Skarbez, Neyret, Brooks, Slater, & Whitton, 2017). A majority of the participants chose enhancements to the VB prior to the other factors (Skarbez, Neyret, Brooks, Slater, & Whitton, 2017). This emphasises the need for a clearly defined avatar in certain VR experiences. Within VR experiences that deal with stage fright, the behaviour of the audience is defined by the VHB. A realistic audience could allow the user to expect their VHB to be similar to reality. However, if these expectations are not satisfied, the coherence reduces. In a similar manner, the P and S should be believable. All of these factors could be bound together by a well-constructed narrative that defines a sense of purpose for the user and a valid reason behind all the events occurring within the simulation. Thus, a simulation inside VR should be designed in a way that it caters meticulously to the details of the VHB, VB, P and S.

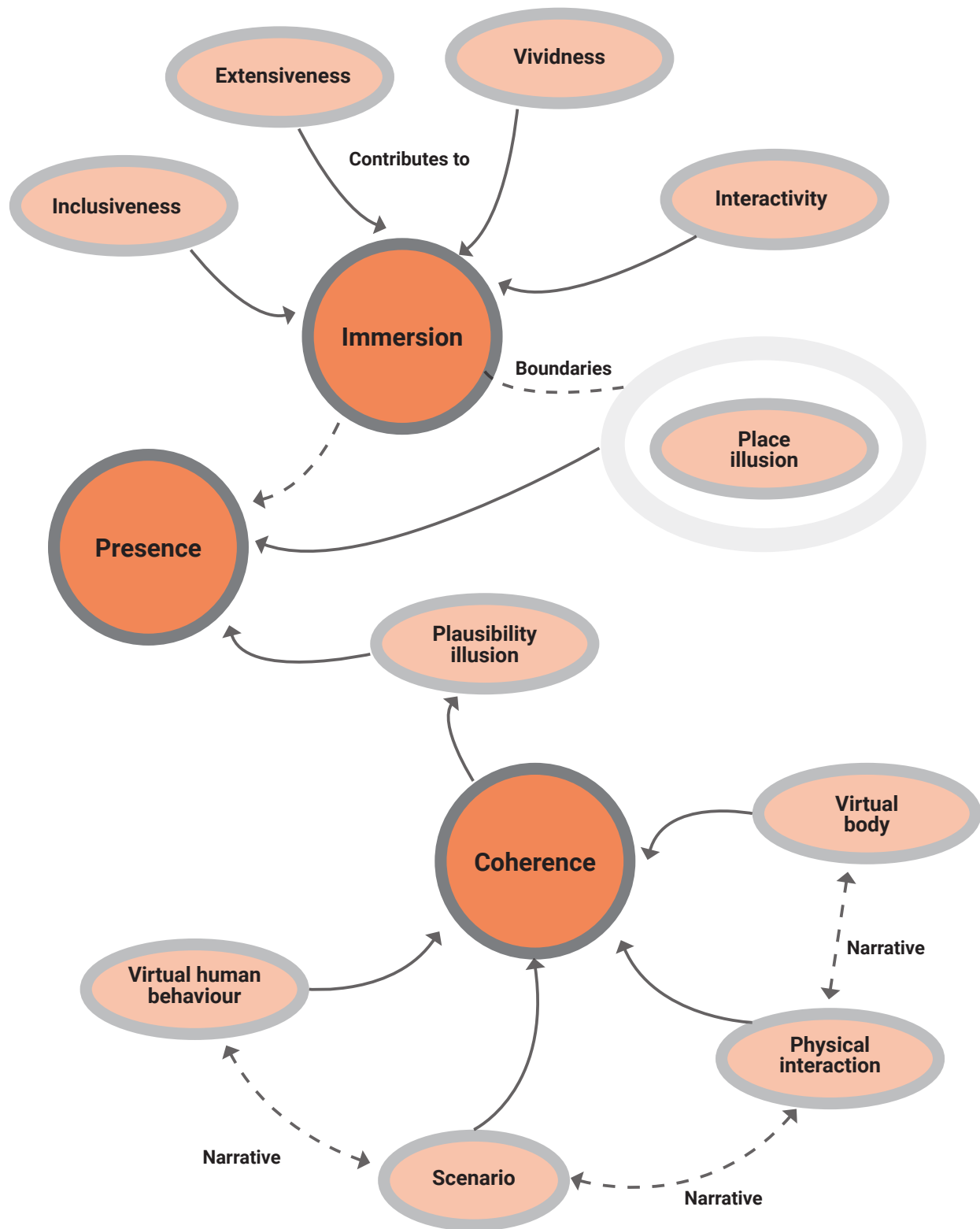


Fig 12. A system map demonstrating the relationship between immersion, presence, and coherence in VR

Overall, this section infers that a VR experience should be immersive, instil presence, and remain coherent in order to be engaging. Applying these frameworks enhances the design of therapeutic VR experiences, such as Phobi.

## 2.3

# Treatment cases

Due to the unique ability of VR to create immersion and embodied presence, interventions using VR have been very successful in treating anxiety-based disorders (Stănică et al., 2017, Pg.4). Through the application of this medium, it is possible to simulate frightening situations and provoke reactionary as well as natural responses from its users. Some of the methods that are examined in the next section include:

- Virtual Reality Therapy (VRT)
- In-Vivo Exposure Therapy (IVET)
- Virtual Reality Exposure Therapy (VRET)



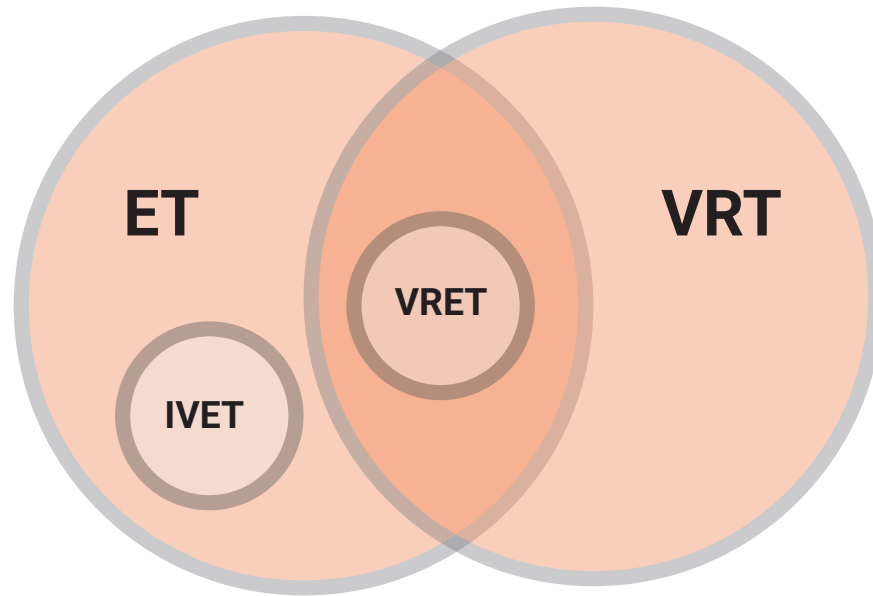


Fig 13. VRET is a type of VRT and ET

## Therapeutic methods

A type of therapeutic treatment method wherein the patient is initially introduced to fear-inducing stimulus and gradually exposed to stronger iterations of it is called Exposure Therapy (ET). The aim of ET is to begin the treatment comfortably, so as to induce a feeling of confidence in the patient and gradually gather motivation as well as the ability to overcome the traumatic stimulus. IVET is a branch of ET that exposes the patient directly to the fear inducing stimulus in real life. VRET, on the other hand, is a combination of VRT and ET; unlike IVET, VRET exposes the patient to the fear-inducing stimulus inside an artificial VR environment. Ever since the documented existence of VRT, VRET has frequently been applied for tackling acrophobia (fear of heights), claustrophobia (confined spaces), arachnophobia (spiders), depression, and most frequently for Post Traumatic Stress Disorders (PTSD) (Bruce & Regenbrecht, 2009; Garcia-Palacios et al., 2002; Levy et al., 2016; Rizzo & Shilling, 2017). A well-known example of VRET is *Bravemind*, a VR experience employed by the US Military for tackling PTSD amongst war veterans.

While VRET is relatively new, IVET has been used for a much longer time, even before VR came into existence. Despite this fact, would VRET be more advantageous? The table below elaborates on both the treatments through a comparison between each other:



VRET	IVET
<p><b>Easier access:</b></p> <p>It is easier to simulate unrealistic scenarios in VR. For example, it would be easier to create an artificial stage using a computer program and allow the user access to perform in front of an animated audience rather than setting up a real stage with an audience to tackle stage fright.</p>	<p><b>Difficult to access:</b></p> <p>It is not always possible to expose a patient to a fear-inducing stimulus or any such scenarios.</p>
<p><b>More control over the stimulus:</b></p> <p>The user or the experimenter can usually decide the range of how frightening the stimulus could be. For example, a well designed VRET experience would allow its users to control the size of an audience while they are on stage.</p>	<p><b>Lesser control over the stimulus:</b></p> <p>It is usually very difficult for the user or experimenter to control the range whilst in the middle of an experience.</p>
<p><b>Inexpensive:</b></p> <p>All that would be required is a therapist and a VR HMD.</p>	<p><b>Expensive:</b></p> <p>It is undoubtedly expensive to create a live audience or a real crowd for the patient.</p>

Table 2. A comparison between VRET and IVET.

Hence, it is clear that VRET is more advantageous to presenters suffering from stage fright rather than if they underwent a form of IVET. This would be a good point in time to return to the first thesis question, namely, “How can VR enable safe and accessible ways of experiencing stage fright as well as alleviate the condition by improving public speaking skills?”

VRET makes a positive case in answering the question. In order to examine the question even further, the next subsection presents certain researched cases wherein VRET has been applied to understand and alleviate stage fright.

## Researched cases

VRET is quite new and has only been used during the past three decades. One of the earliest documented controlled studies delving into the fear of public speaking was conducted by North et al. (1997) through a collaboration of Clark Atlanta University (CAU) along with the U.S. Army Research Laboratory and Boeing Computer Services, with special technical assistance from the Speech Improvement Company Inc (North, North, & Coble, 1997). In this VR experiment, the experimenters simulated a fairly large auditorium comprising of a hundred seated audience members. The participant stood on a speaker’s stand and heard echoes of

their own voices in the VR environment. Upon engaging with the simulation, participants **experienced similar symptoms of fear** that were mentioned in the previous chapter. Eventually, through multiple testing sessions, the participants reported lower anxieties and renewed confidence while facing real-life situations with public speaking (North, North, & Coble, 1997). This experiment was perhaps the first successful application of VRET in treating stage fright.

In the early 2000s, one such controlled test was conducted by Slater et al. (2006) with a sole purpose of examining stage fright within VR (Slater, Pertaub, Barker, & Clark, 2006). The focus of this test was more on analysing these fears and not on overcoming them. The experiment involved two groups containing 20 participants each. While each participant underwent the VR experience, one group was asked to speak to an empty room while the other faced a computer-generated audience. After the experience, the participants were asked to complete a questionnaire designed to explore their subjective experience. Through the course of the session, each participant's heart rate was measured. Eventually, the participants that spoke to a room with a large audience exhibited a higher measured heart-rate. On this point, the questionnaire deduced that the confident speakers had a lower heart rate compared to the phobic ones. Overall, the **participants experienced stage fright despite low technological fidelity and overall immer-**

**sion of the VR headsets and inadequate behaviour responses of the audience.** It indicated that realistic simulation is not a high criteria and suspension of disbelief could be achieved with low immersion as long as presence is maintained throughout the experience (Slater, Pertaub, Barker, & Clark, 2006). On another note, it is interesting to question whether this pattern of heart rate exhibited would be similar if the participants are more familiar with VR Headsets and have experienced such simulations on a frequent basis. In recent years, many more people have been adapting to VR and may not have suspended their disbelief as much when compared to their first attempt with a VR experience.

Another controlled study conducted by Anderson et al. (2003) involved two middle-aged women suffering from stage fright who attempted to overcome it through VRET (Anderson et al., 2013). One of these participants aspired to teach in a classroom while the other sought to overcome general social anxieties. The classroom environment within VR consisted of an artificial setting containing a 360° video of an audience. VRET was conducted through a gradual series of sessions beginning with a friendly audience that slowly transitioned into a bored one. In the test, an intervener was always present throughout the experiment in order to oversee the situation and provide assistance whenever required. The test participants experienced symptoms of anxiety during the sessions, especial-

ly when they started. Over the course of multiple sessions, their stage fright reduced and both participants reported improvement in their career and lives. A major interesting limitation of the study noted by the researchers (2003) was that different participants possess their own range of anxieties and subjective emotions that is challenging to accommodate during the sessions and within VRET in general (Anderson et al., 2013).

Slater's (2006) study highlighted that stage fright could be induced even with a low level of fidelity in the audience. However, with the rapid emergence of VR as a technology, it is currently possible to simulate a very realistic audience coupled with fine behavioural patterns. In relation to this aspect, Ni-Kang (2016) poses an important question in her thesis, "[w]ithin public speaking scenarios, how can an expressive virtual audience be created and how do the experiences with a virtual audience affect the presenter?" (Ni-Kang, 2016). In order to answer it, Ni-Kang provides four validated hypotheses, "

- H1. A parameterised audience model can generate virtual audiences with expressive behaviour.
- H2. People can recognise different styles of the expressive behaviours generated by the audience model.
- H3. People are more satisfied about practicing with a virtual audience than practicing with an imaginary audience.

- H4. The level of self-identification affects self-efficacy after a first-person-perspective vicarious experience" (Ni-Kang, 2016).

Without a doubt, the behaviour of the virtual audience is fundamental to maintaining presence and coherence in a VR experience that deals with public speaking. This is because the presenter might be gazing at or interacting with the audience for most of the time in the VR experience. Any flawed or unexpected behaviour would lead to a break in presence. Hence, the design of the virtual audience must cater to intricate details and enhance the presenter's experience.

All these examples highlight the mechanisms through which VR has enabled safe ways of experiencing stage fright and gradually alleviating it. However, these VRETs often require the presence of an intervener. This begs an important question: What if the user does not have access to a therapist or is perhaps unable to visit one? Considering the nature of VR's technological advancement and accessibility, it is possible for its users to have these devices in their own homes. It would undoubtedly be much easier for these users to experience such a simulation using their own devices and help themselves out without the requirement of a therapist. They could download commercial applications online and experience them. The next subsection probes into these applications that tackle stage fright.

Fig 14. A scene from Virtual Speech



Fig 15. A scene from Speech Center VR



Fig 16. A scene from Virtual Orator

## Commercial applications

At the time of writing, there are many upcoming commercial VR applications that aim to tackle stage fright within the comfort of a user's own place of choosing. These applications do not advertise themselves as VRET and do not require a therapist or an intervener. However, they do contain elements of VRET, such as gradual exposure to the stimulus and attempting to help its user to overcome their fears. This section examines the top 3 trending applications and compares their features. Eventually, the section also highlights certain aspects of these applications that are valuable for Phobi's design.

	Virtual Speech	Speech Center VR	Virtual Orator
<b>Platform</b>	Playstore with Google Cardboard, Merge VR, Blitzwolf VR; Oculus GO; Gear VR powered by Oculus.	Gear VR and Playstore.	'VR Ready' PCs with Oculus, SteamVR and Windows MR (Mixed-Reality).
<b>Overall approach</b>	Highly business-oriented.	Serious content mixed with amusement.	Simplified with pure practice.
<b>Short description from their websites</b>	"Learn fundamental business skills through our on-line classes. Practice these skills in immersive virtual reality. Improve with our unique learning approach" ("VirtualSpeech - Soft Skills Training with VR," n.d.).	"Speech Center VR helps you to become a better communicator through a series of interactive VR lessons real-time time lectures with top coaches, and the ability to practice solo — all in unique, immersive and responsive virtual environments" ("Speech Center VR," 2015).	"Virtual Orator revolutionizes public speaking skill development. A VR application that provides the right audience for every training need" ("Virtual Orator," n.d.).
<b>Main features</b>	Public speaking and delivering presentations, job interview preparation, sales training, learning english for business. Online classes with tutorial videos. Feedback with tracking technology that measures hesitation, eye contact and pace. Audio recordings of the speech.	Tutorials before speech. Upload own presentations. Amusing distractions. Audio recording of the speech.	Multiple use cases for individuals at home and trainers. Video recording one's practice with a webcam. Choose between multiple venues.
<b>Immersion, presence, and coherence</b>	Often incoherent due to a lack of reaction or feedback from the audience. This is because the stage is set expecting a certain type of behaviour from the audience and when the expectation is not met, it breaks PSI.	Maintains presence very well at most times. Very coherent aesthetic style that provides an essence of the place a player is in. Humour adds to the feeling of absurdity and not always anticipating realism. Sometimes incoherent due to the lack of audience's feedback.	Adequately maintains presence during speech. The sense of presence is sometimes broken due to a lack of audience reactions.
<b>Audience behaviour</b>	Largely static audience with minimal reactions to the speech.	Audience moderately reactive, but their reactions are often inaccurate.	Minimal at times and often no reactions
<b>Improving public speaking</b>	Presenters are able to upload their own slides and practice in the virtual room. Feedback is provided to users regarding their pace of speech, use of filler words, and whether they are maintaining sufficient eye contact with audience.	Tongue twister exercises. Distractions from the audience that might interrupt the speech.	A variety of venues for users to practice according to their need. A range of audience to choose from.

Table 3. Outlining the main aspects of Virtual Speech, Speech Center VR, and Virtual Orator.



Having tested these applications a few times, here are some highlights:

- *Virtual Speech* contains a very realistic simulated environment established through actual 360 photos taken from real spaces, such as offices, conference rooms, and arenas. It immediately induces a sense of presence. The application is moderately therapeutic and provides its user with plenty of choices, such as adjusting crowd sizes and activating a timer during a presentation.
- *Speech Center* takes an interesting approach by engaging with humour in order to create distractions and additional challenges to the user while they present. For example, dinosaurs and robots appear on stage at certain instances. During other times, there is also unscrupulous behaviour from the audience members.
- *Virtual Orator* provides the option of impromptu consisting of randomized topics that are aimed at providing cues to the user regarding their speech. This option is often used in case a user is not prepared with their own presentation or if they simply want to attempt something new and different.

These applications do somewhat answer the primary research question, namely, “How can VR enable safe and accessible ways of experiencing stage fright as well as alleviate the condition by improving public speaking skills?” Despite this ability of all the applications, their user reviews are not entirely positive (“Speech Center VR,” 2015; “VirtualSpeech - VR Courses,” 2016). In fact, many of the user reviews mention that the applications are not engaging nor are they any fun. However, some of the reviews note that the most engaging part of these applications were the gamified elements (“Speech Center VR,” 2015; “VirtualSpeech - VR Courses,” 2016). This begs the question: Could a VR game that tackles stage fright and improves public speaking create a more engaging experience? The next chapter delves into details about games and outlines why Phobi is slated to be more engaging as a game.

# 3

## GAMES AS AN APPROACH

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All of us as humans have played games at different points in our lives. Games serve as a social bond; we play games with our friends, family members, strangers, and sometimes even our rivals or opponents. These games could range between a pack of cards to outdoor sports. Nowadays, with the advent of digital gaming on our PCs, consoles, phones, and most recently VR, the average most of time a person spends gaming is rapidly accelerating (Bender, 2016). It could be stated that civilization has progressed this far due to games because fields such as politics, law, and war are either games or contain game elements within them.

Due to the profound impact of games in many people's lives throughout history, my own solution to the first research question suggests the implementation of games as an approach to alleviate stage fright.

This invites a couple of questions:

- How effective are games in solving problems?
- How can gaming play a part in a therapeutic VR application that seeks to tackle stage fright?

This chapter delves into the questions mentioned above and attempts to answer the first research question of the thesis.

## 3.1

# Play and performance

Since Phobi is being designed as a VR game, it would be played by its users. Within the game environment, the player performs in front of a simulated audience. Therefore, play and performance constitute some of the key elements of Phobi, and it is essential to understand the relationship between for a better design.



## Play

We all know and understand what play is, yet, it is very hard to define. One of the earliest scholars to define play was Huizinga (1980), who characterized it as, “a free activity standing quite consciously outside ‘ordinary’ life as being ‘not serious’, but at the same time absorbing the player intensely and utterly” (Huizinga, 1980). This statement regarding games not being serious is perhaps blatant. Proclaiming that it is an outdated notion, Hamayon (2017) asserts that the dismissal of play as being frivolous or not serious is not entirely true (Hamayon, 2017, p.29). In fact, there is a budding genre of games called ‘serious games’, which are designed for purposes beyond pure entertainment and frequently applied in fields of education. These games may not fit within Huizinga’s framework.

A more accommodating idea of play is provided by Caillois (1961) who defines it as an activity that is:

- Free: Being voluntary.
- Separate: Has its own boundaries of space and time.
- Uncertain: The course of events cannot be precisely predicted.
- Unproductive: “creating neither goods, nor wealth, nor new elements of any kind; and, except for the exchange of property among the play-

ers, ending in a situation identical to that prevailing at the beginning of the game”.

- Governed by rules: Has its own rules that suspend ordinary laws.
- Make-believe: An alternate reality contrasting with ‘real-life’ (Caillois, 1961).

Some of these factors that determine the nature of play enable a momentary suspension of reality and even create an alternate scenario within a player’s mind. It is quite similar to a well-designed immersive VR experience that creates a sense of presence and is able to suspend disbelief. While the scenario for play is largely imagined, a VR experience is externally stimulated. A mix of these two experiences could exponentially aid in the momentary disconnect from reality.

It could be said that a player of a VR game becomes a performer inside the simulation. This is especially relevant if the player goes on an artificial stage in VR and begins to perform. The next subsection explores the relationship between play and performance.

## Performance

The word ‘performance’ has multiple meanings. It is often used to describe the act of presenting a play, speech, or

any other form of entertainment (“performance | Definition of performance in English by Oxford Dictionaries,” n.d.). At the same time, it is also a measure of the action or process of executing a task or function (“performance | Definition of performance in English by Oxford Dictionaries,” n.d.). Phobi contains the act of presenting as well as the measure of the process of completing tasks within the game. Hence, for the scope of the thesis, both the definitions are fused and performance is defined as “the measure of achievement when a player is caught in the act of presenting”.

Delving back into the history of play, McConachie (2011) states that “(o)ur impulse to craft performances and to engage with the performances of others comes from our evolutionary heritage of play” (p.35). Along with humans, there are certain other animals that also engage in play. What separates Homo Sapiens from other species is the ability to “embody and perform a subjunctive reality as a part of play” (McConachie, 2011, p.39). The word ‘play’ is also used to describe theatrical performances in front of audiences. Usually, a performer acts out an imagined scenario in front of an audience. To make the distinction between play and performance clearer, the McConachie (2011) outlines that “[n]o other animal can project itself into and out of imagined roles to create the kind of ongoing activity” (p.39). She goes on to state that “[e]volution equipped Homo sapiens with

this mode of mental projection around 50,000 years ago and perhaps earlier” (McConachie, 2011, p.39). The ability for mental projection is definitely unique to humans.

The idea behind mental projection also holds true when presenters walk on stage and deliver their presentation. The presenter is now a performer and may, for example, pretend to be confident while actually being nervous; the audience is caught in this act. Therefore, it could be implied that the performer is undergoing some sort of inner transformation while pretending. Phobi attempts to examine this transformation in VR by implementing different avatars at several points of the game.

Currently, the overwhelming number of VR games are played through the first-person perspective. This means that players observe the virtual world with their own eyes. However, almost all HMDs contain a technological limitation, wherein players are unable to see their own body inside the simulation. Instead, they either see nothing in place of their body or an avatar’s body as a replacement. A valid example of a VR game wherein the player controls an avatar’s body is *Tornuffalo*. In this game, players dodge fire hydrants, vans, and buffalos flying towards them caused by a tornado’s effect. They also control an avatar that is completely mapped to their actual body



Fig 17. Tornuffalo - A VR game supporting full body tracking.

because of controllers tied to their hands and feet as well as a tracker attached to their waist. Nevertheless, Tornuffalo is known to successfully provide players with the illusion of being in a different body and making them believe that it is their own (Brennan, 2017).

Based on the avatar research, an intriguing question to pose would be: Do players undergo a transformation in perception and behaviour when they control an avatar's body instead of their own while presenting in VR? The answer to this question could be provided by Cuddy et.al's (2012) paper regarding the benefits of power posing (Cuddy, Wilmoth, & Carney, 2012). The authors (2012) assert that pretending to be confident by maintaining a powerful posture actually induces confidence and maximises performance during a presentation (Cuddy, Wilmoth,

& Carney, 2012). It is interesting to examine whether this notion is also true when players of a VR game control an avatar that maintains a confident and powerful posture in contrast to their original posture.

This section has posed more questions than answers and requires further research into many of its topics. Overall, it could be roughly stated that performance is a part of play in a game like Phobi and is capable of shaping a player's outcome in real-life, too. A well-designed game that deals with stage fright should provide space for play and enable its players to gradually improve their performance. The next section regarding the effectiveness of games describes how they are capable of allowing players to improve their performance, conquer obstacles, and attain valuable goals.

## 3.2

# Effectiveness

### Motivation and flow

While examining play from an anthropological standpoint, Hamayon (2016) asserts that “[p]laying allows us to naturally test our limits while suspending the constraining conditions of reality in order to imagine other paths” (p.25). He (2016) also states that “consciousness of playing creates an alternate belief system, a factor of optimization” (Hamayon, 2016, p.25). In a similar manner, Csikszentmihalyi (1990) equates ‘optimal experience’ with a sense of exhilaration as well as a deep sense of enjoyment (Csikszentmihalyi, 1990). He (1990) further states that an optimal experience occurs “when a person’s body or mind is stretched to its limits in a voluntary effort to accomplish something that is difficult or worthwhile” (Csikszentmihalyi, 1990). This aspect of optimal experience is crucial, as it could allow presenters on stage to immerse themselves in a deep sense of enjoyment and accomplish the challenge of overcoming their own stage fright.

In her acclaimed book *Reality is broken*, Jane McGonigal (2011) highlights the importance of an effective and engaging

game by emphasising that it channels experience and allows motivation for hard work (p.33). Moreover, she (2011) asserts that motivation and interest are triggered as long as the game’s player feels capable of meeting those challenges (p.32). They then mitigate the player’s stress and instead instils satisfaction (p.32). This process requires two components: a clear goal indicating what a player must accomplish as well as actionable steps towards the goal that exhibit results and indicate immediate progress (p.55). There are obviously obstacles and challenges en route to these accomplishments, and, in her words, overcoming these obstacles “build[s] our sense of self-worth” (p.57). McGonigal (2011) then aptly concludes that “when we do hard work that we care about, we are priming our minds for happiness” (McGonigal, 2011, p.29).

Overcoming obstacles in game play provides a sense of enjoyment. Csikszentmihalyi (1990) defines seven major components responsible for enjoyment:

1. Tasks with a reasonable chance of completion.
2. Clear goals.

3. Immediate feedback.
4. Deep but effortless involvement that removes from awareness the frustrations and worries of everyday life.
5. Sense of control over our actions.
6. No concern for the self.
7. Alteration of the concept of time, hours can pass in minutes and minutes can look like hours (Csikszentmihalyi, 1990).

A VR game could incorporate some of these components and allow its player to enjoy the game in order to reduce their stage fright. In addition, an immersive environment in VR is capable of minimizing or even eliminating external distractions that could potentially hinder a player. Eventually, these steps could provide an optimal experience and allow players to achieve their goals.

When playing games, a player accumulates rewards by completing goals or even sub-goals. McGonigal (2011) comprehends the significance of these rewards and highlights that “[w]hen an experience is difficult for us, offering challenging goals, tracking points and levels and achievements, and providing virtual rewards can make it easier to get through the experience” (p.156). Nevertheless, she (2011) notes that there are many occasions in people’s lives wherein they feel underappreciated and fail to receive rewards for better achievements.

In contrast to reality, many games offer players rewards for conquering obstacles, and this makes them stronger through practice and experience.

## Failure

A very interesting aspect of games is the nature of failure in them. While in real life, failure could lead to a break-down, pessimism, and fears, it is usually inconsequential to fail in a game. Moreover, within games, it is noticeable that the closer players are to the goal when they fail, the more they are willing to attempt again. However, there are limitations to this as well; for example, repeated failures without any significant progress could hinder a player’s motivation. Based on these notions, McGonigal (2011) proclaims that “[w]hen we’re playing a well-designed game, failure doesn’t disappoint us. It makes us happy in a very particular way: excited, interested, and most of all optimistic” (p.64). Further on she (2011) concludes by emphasising the relevance of motivation and goals and relating it to failure: “Positive failure feedback reinforces our sense of control over the game’s outcome. And a feeling of control in a goal-oriented environment can create a powerful drive to succeed” (McGonigal, p.67). Hence, it is safe enough for a player fail while practicing and improving their speech in a well-designed VR game.



This optimistic notion of failure is not always ideal and definitely incurs certain limitations, which are also attested by McGonigal (2011): “Clearly, we have to be thoughtful about where and when we apply game-like feedback systems. If everything in life becomes about tackling harder challenges, scoring more points, and reaching higher levels, we run the risk of becoming too focused on the gratifications of positive feedback” (p.157). Other glaring limitations include becoming addicted to rewards, motivation, reinforcements, goal-driven tasks, and hence games themselves. In recent years, game-addiction has become a major problem in some countries; this has led to serious consequences, such as depression, heart-attacks, and even suicide amongst addicts. A VR game about stage fright should be designed with an awareness of these limitations.

## Humour

Many games have the tendency to possess or elicit content that often turns out to be funny and amuse their players. Humour is simply defined as “the quality of being amusing or comic” (Dictionary.com). This quality is very effective and Morreall (2009) asserts that it “allows us to think, say, and do things that would normally be forbidden” (pp. 49–58). In this manner, humour could help in reinterpreting fears that one commonly faces; this has been proven by some studies (Ventis, Higbee, & Murdock, 2001,

Whitehurst, 2014).

A study conducted at Stanford University revealed that humour has the ability to ease fear by forcing a change of perspective (Samson & Gross, 2012). This was noticeable when the participants of the study were presented with a series of disturbing images from the database of International Affective Picture System (IAPS) and asked to reinterpret them and improvise jokes. The findings eventually showed that positive humour facilitated reappraisal while negative humour may not have had such an effect, but produced no negative consequences as well (Samson & Gross, 2012). This proves that adding humour to a game is advantageous, and it may facilitate stage fright to be re-examined with a different perspective. It is important to understand how humour is very effective and what are some of the theories that lead to the effectiveness.

There are many theories that outline the effectiveness of humour. A popular theory that explains humour is called ‘Benign Violation Theory’ (McGraw & Warren, 2010). It asserts that a person finds humour in a **situation that is a violation** and the violation is benign. A violation turns a person’s current notion of the world topsy-turvy. The situation has to be benign in order not to induce what we perceive as literal harm to the subject (McGraw & Warren, 2010). Other

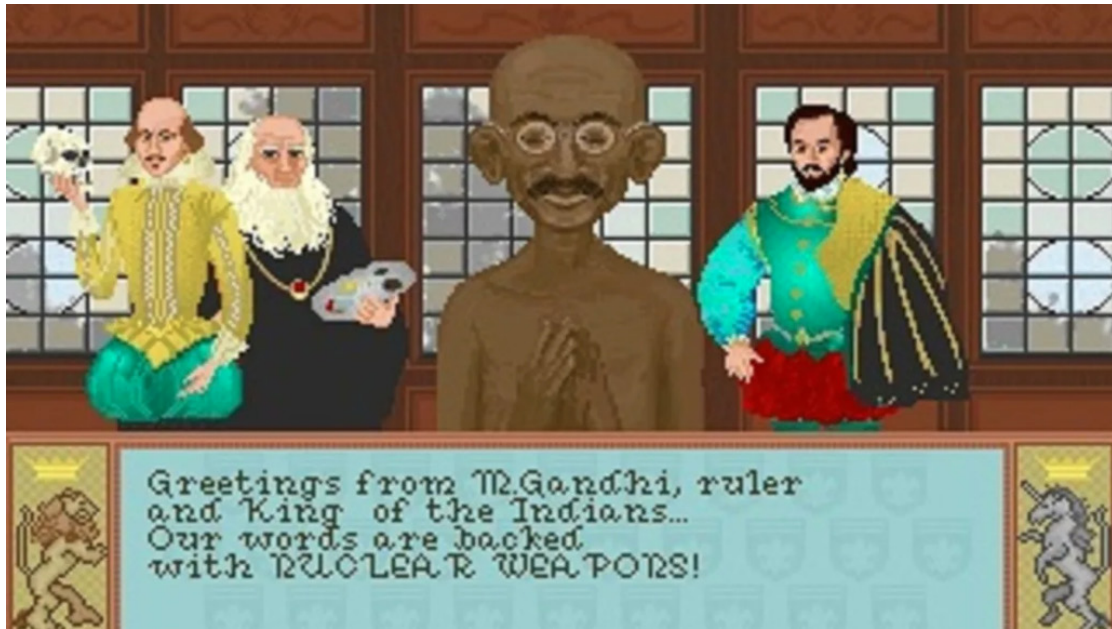


Fig 18. Gandhi turning into a Warmonger in the Civilization game series due to a glitch.

theories that explain humour are the Relief Theory, Superiority Theory, and Incongruity Theory. The Relief Theory attributes humour to the **release of psychological tension** that was previously built up (Buijzen & Valkenburg, 2004). The Superiority Theory traces the idea to a **person's domination and shortcomings of others** that are mocked (Plato, n.d). The Incongruity Theory states that humour occurs when **a given concept is perceived and unexpected behaviour is received instead**; this is very similar to the Benign Violation theory (Beattie, 1778). A VR game tackling stage fright could incorporate certain aspects of these theories in order to amuse its players and counter their fears.

Unlike other forms of traditional media such as theatre or film, digital games tend to evoke more amusement instead of direct laughter (Grönroos, 2013, p.9). This could be because of the nature of the medium that allows more interaction and input from the player compared to other forms of traditional media. Because of this interactive ability, humour can be derived through a game's mechanics. Players possess the ability to inject their own humour into the game system through their interactions. These could be deliberately caused by players or occur due to unintended consequences. Another type of humour occurs when the rules or boundaries of a game are broken, and these are known as 'bugs' or 'glitches' (Grönroos, 2013, Find page). A good example is noticeable in the series

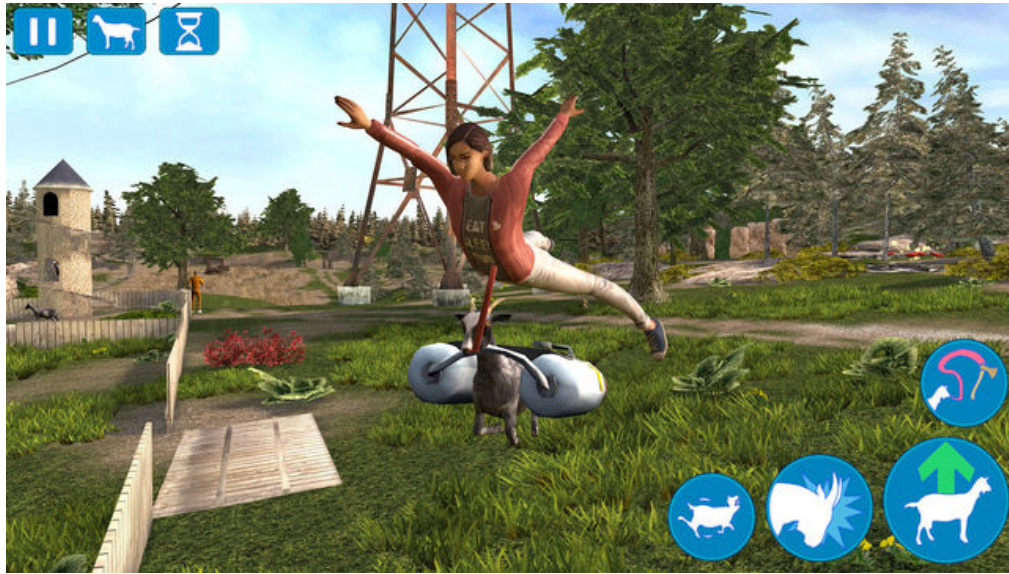


Fig 19. The glitchy features in Goat Simulator.

of *Civilization* games, wherein world leaders are given a set of attributes that dictate each one's behaviour. One of the attributes is a number scale that indicates aggressive behaviour. In some of these games, the Indian leader Gandhi has the lowest number possible, a rating of 1. However, whenever a civilization adopts democracy in the game, it grants a civilization -2 to the opponent's aggression levels. This used to set Gandhi's rating of 1 into a negative value and accidentally swung it back around to 255, which is the highest possible rating available. This process made Gandhi an infamous war-monger, which is seen as a benign violation and amused many players.

Although these glitches could be funny, they are often annoying and could lead players to quit the game. Within VR, such unexpected behaviour could lead to a break in the players' sense of presence. However, if the game is carefully designed, these glitches can be deliberately incorporated to foster humour. *Goat Simulator* is an interesting example of a game wherein the glitches are a part of the game's appeal. In this game, players control a goat that has its tongue sticking out. Licking objects attaches the goat's tongue to the objects and allows players to drag them around until they let go. In this manner, many absurd objects are able to attach themselves to the goat and these range between fruits to gas cylinders to heavy automobiles. This absurdity



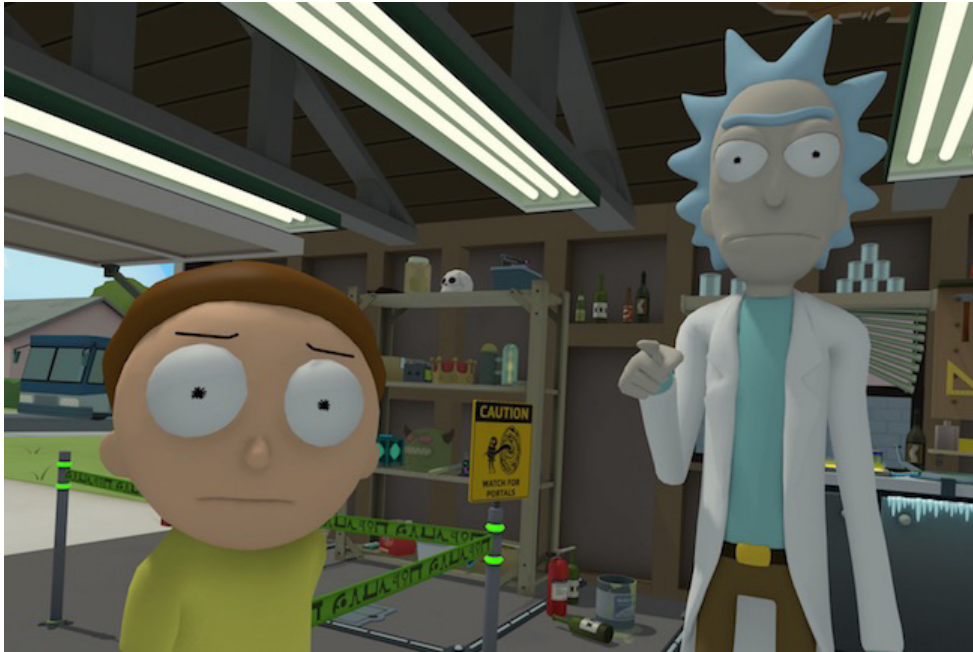


Fig 20. A scene from *Rick and Morty: Virtual Rick-ality* - A VR game coated with humour.

often allows players to normalize unintended events, thereby accepting them as a part of the game's features rather than limitations.

Within VR, a good game coated with humour is *Rick and Morty: Virtual Rick-ality*. This game is based on the TV series titled *Rick and Morty*. Players assume the role of the hapless adolescent Morty as the main character, and they are constantly confronted by their grandfather and mad scientist, Rick. They embark on interdimensional quests to restore order to chaotic situations that the characters find themselves in. In this manner, the gameplay is replete with benign violations, and some examples include

escaping purgatory to hatching aliens in their garage. The tasks at hand frequently result in exposing Morty's weaknesses and unexpected outcomes that potentially amuse players.

Not only are these types of games funny, but they also possess emotional and cognitive functions. These functions have been asserted by Dormann and Biddle (2009), who state that "[t]he emotional functions of humour contain enhancing the mood of the players, generally drawing interest, and providing relief. Almost any game could benefit from these, and aiming for amusement rather than laughter is enough to lighten the overall game experience" (p.25). They go on to state



Fig 21. Mindspace - A CBT game that helps in minimizing anxiety disorders.

that “[t]he cognitive functions of humour involve improving problem-solving and creativity by developing divergent thinking” (Dormann & Biddle, 2009, p.25).

Hence, certain key aspects of humour in games are:

- Changes in perspective and reinterpreting fears
- Violation in an expected situation
- Release of psychological tension
- Domination and shortcomings
- Bugs and glitches
- Enhancing the mood of players

These aspects of humour are very valuable and enhance gameplay. Some of them have been applied in psychological therapeutic treatments, and they are examined in the next section.

## Therapeutic applications

A combination of gaming and humour has been applied in Cognitive Behavioural Therapy (CBT) in order to treat or minimize anxiety disorders. All the elements mentioned earlier such as motivation and rewards, are implemented in *Mindspace*, a CBT game that treats anxiety disorders in children (Göbl et al., 2015). For example, players are able to collect stars that can be exchanged for artificial toys in the game. Later on, they receive virtual flags on planets that are aimed at providing a sense of accomplishment. The authors (2015) concluded that these elements foster a sense of connection, fun, escape from reality and have successfully aided in allowing children to forget about their anxieties (Göbl et al., 2015). In a similar manner, other serious games have been very effective in treating disorders and phobias through the use of CBT (Engström, 2014; Stapleton, 2004).

This is also true in VR, wherein a study showed how VRT blended with serious games was applied to treat the fear of



Fig 22. Niechwiadowicz's (2017) experiment in countering social phobia using VRET with game mechanics.

falling (Levy et al., 2016). Often underestimated, the paper pointed out that fear of falling was approximately prevalent in 24-55% of elderly people. Upon wearing VR HMDs, the participants of the study were exposed to virtual worlds containing a city, castle, island and underground for about 15 minutes. The participants were seated and could move their VB using a mouse. At the same time, they were asked to either wash a window or combat enemies by using their hands in the virtual world. The level of difficulty was adjusted by the therapeutic intervener as and when the participants made progress in the game. This type of fantasy based narrative and in-game progress aided in the treatment of participants' fear of falling (Levy et al., 2016).

In another study, Niechwiadowicz (2017) examined stage fright using VRET and game mechanics (Niechwiadowicz, 2017).

The target of this study involved patients with generalized social phobia, i.e social phobia that extends to public speaking and other social situations involving interaction with people. Through the application of CBT and VRET, she (2017) posed the main research, "[i]s it feasible to build a VR system for treatment of the generalized type of social phobia, and how can we incorporate game mechanics to improve the experience?" (Niechwiadowicz, 2017). Some of the game mechanics required players to articulate clearly with other virtual humans in order to receive a password that unlocks the next level. The game was tested with a few participants over multiple iterations. She (2017) concluded that VR is able to mimic real scenarios quite well, and gameplay elements such as rewards for accomplishments provide positive affirmation as well as motivation for patients to continue the scenario despite their fears (Niechwiadowicz, 2017).

## 3.3

# Implementations

As reviewed earlier, games possess the ability to generate motivation and instil a state of flow during the course of attaining a goal. They also momentarily disengage a player from reality. In this manner, they have allowed patients to forget about their stage fright and instead engage with the gameplay. The next subsection assesses certain VR games and evaluates their features.

### VR games

Only a handful of VR games exist that deal with stage fright. However, they are very creative and enticing. Unlike the VR apps mentioned in the last section of the previous chapter, these games aimed to tackle public speaking indirectly through the use of characters, narrative, and other scenarios. *Stage Presence* and *The Talking Dead* are especially interesting as they force players into a scenario that requires them to speak immediately. The following table compares their most interesting features.





Fig 23. A scene from Stage Presence.



Fig 24. A scene from The Talking Dead.

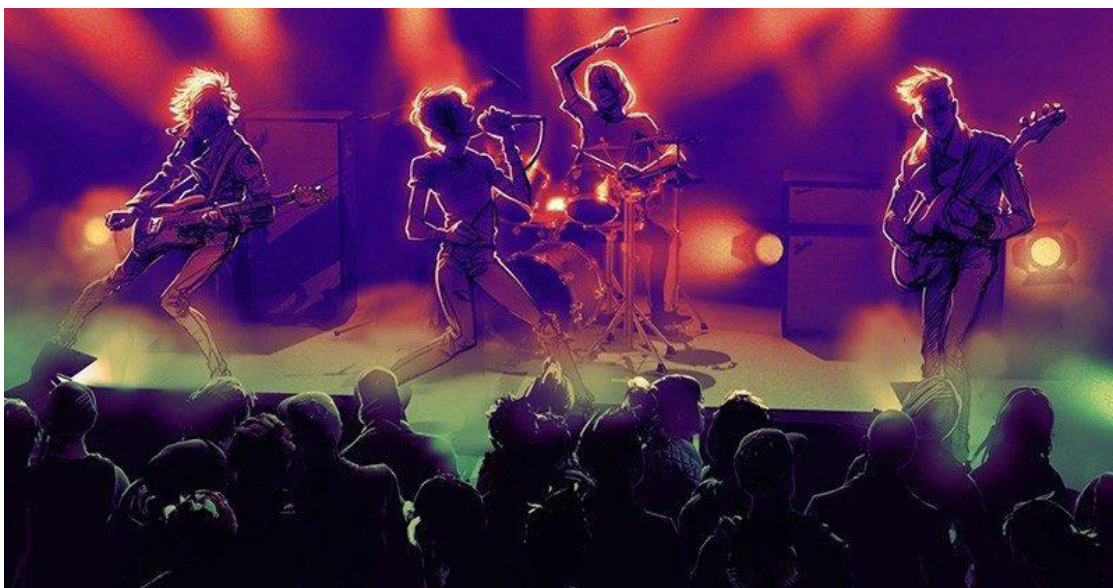


Fig 25. A scene from Rock Band VR.

	Stage Presence	The Talking Dead	Rock Band VR
<b>Platform</b>	Steam for PC.	Conceptual prototype intended for Mobile VR devices.	Oculus Touch and requires guitar controller.
<b>Outline</b>	A humourous game that requires the use of voice and wits to pacify a crowd during a technical breakdown.	A game that helps the player overcome stage fright by killing zombies using certain cue words.	A musical game wherein the player practices guitar on a virtual stage in front of a massive audience.
<b>Public speaking skills</b>	Approximately two minutes provided to the player in order to say anything that would pacify a crowd before the concert begins. Requires stimulation of the attention deficit audience through shouting and constant arousal.	Uses cue words to quickly construct sentences within time limits and leads to absurd as well as funny sentences. Forces players to speak and forget about their anxieties because it frames them into a life-death scenario.	None - Provides players with a feeling of being on stage while being a rockstar.
<b>Immersion, presence, and coherence</b>	Cheering crowd with realistic audio invokes a sense of presence of actually being in the concert.	These aspects were not examined since the game is not yet available for download. The scenario was coherent.	Other characters who are singers appear closeby and this provides a feeling of being together. With the crowd being too close, repetitive animations break PSI.
<b>Motivation &amp; flow elements</b>	Instant feedback from the audience sometimes directs speech. Time limit serves as a constraint. More room for open-ended speech that makes players think quickly and act fast. Rewards with statistics and feedback at the end of a game session.	Fast appearing cue words enable quick sentence creation. Zombies appearing closer act as obstacles and challenge players. The score keeps track of how many zombies are killed by the player.	Constant flashy aesthetics with loud music provides an exhilarating flow. Score with statistics at the end serve as a reward.
<b>Avatar</b>	Gloves replacing the player's hands. No avatar body.	None.	Virtual guitar superimposing on the player's real guitar. No avatar body.
<b>Humour</b>	Boos from the crowd.	Zombies seem weird and funny.	No apparent humour.
<b>Unique features</b>	Has the ability to portray a player's inner thoughts that are spelt out through improvisation. Reaction of the crowd is partially determined by the confidence level of the speaker.	Enhances creativity by forming sentences out of cue words. A repeated practice has the potential to improve a player's verbal articulation.	Inspired by Guitar-Hero. Music could help in pumping up players' mood and boosts their confidence.
<b>Overall user reviews</b>	Very well received on Steam with players generally praising the concept ("Stage Presence on Steam," n.d.).	No reviews yet, since the game has not been published at this point.	Well received from major game review sites ("Rock Band VR," n.d.).
<b>Drawbacks</b>	The game could get cumbersome after playing it repeatedly due to a lack of variation in gameplay.	Hard to judge on a conceptual level. The game could be richer with variations in levels of difficulty and environments.	Repetitive animations from the audience at a visible level.

Table 4. Outlining the main aspects of Stage Presence, The Talking Dead, and Rockband VR.

These are only a few games in the market and there is certainly a potential for much more in the upcoming years. Therefore, why not favour these games that indirectly tackle stage fright over the VR applications explicitly aiming to improve public speaking? An argument could be made that these games purely remain in the domain of fun and entertainment and are not intended to tackle stage fright. These games are compared with VR applications to discern their advantages as well as disadvantages. The aspects outlined in the comparison are broader characteristics and not very specific for every single VR application or game.

VR applications	VR games
Focused goal of conquering stage fright through rigorous practice in a simulated environment mimicking reality.	Geared towards fun, entertainment, scoring points and dealing briefly with stage fright.
Realistic audience with sharper fidelity aimed at optimal behaviour towards user's speech.	Audience inclined to be sketchy, goofy, randomized, and providing impressions at speech.
Serious content with minimal humour.	Not serious and loaded with humour.
Feedback through manner and style of speech.	Feedback through points and artificial rewards.
A weak or non-existence of narrative.	Stronger narrative and setting with characters in-game.

*Table 5. Comparison between VR applications and VR that deal with stage fright.*

All of these comparisons argue that a VR game would be more engaging in order to combat stage fright rather than a non-game VR application. However, a drawback to the games mentioned earlier is that they do not exclusively focus on stage fright. If Phobi were to be designed as a VR game, the main focus of its gameplay should be oriented around stage fright and its alleviation as well as improving public speaking.

## Phobi

This is another good point in time to refer back to the first research question: **How can virtual reality enable safe and accessible ways of experiencing stage fright as well as alleviate the condition by improving public speaking skills?** A VR game could help in doing so only if the game:

- Implements elements of VRET
- Maintains a fluid relationship between play and performance.
- Provides motivation and a state of flow to its player through challenges, obstacles, and rewards.
- Allows the player to practice and fail repeatedly without major consequences.
- Contains plenty of humour that reinterprets their fear.

These crucial points have been outlined earlier in this chapter.

In this manner, Phobi is slated to be ideal as a VR game because it could allow:

- Players to repeatedly practice public speaking in an artificial environment geared towards a clear goal.
- Players to feel energized to meet challenges and conquer obstacles.
- Players to visualize their own progress through actionable steps.
- The consequences of failure to trigger further motivation in players.
- Players to be rewarded for their success.
- Disengagement from reality for players and momentarily making them forget about their fears.
- A narrative and a role for the player that provides them with a sense of purpose.
- Eliciting of humour that reinterprets and counters players' fears.

The previous two paragraphs provided broad answers to the first research question, and serve as useful guidelines for designing a VR game with stage fright in mind. Overall, this chapter analysed digital games and examined their constituents. The effectiveness of games was assessed by analysing motivation, flow, failure, and humour. Eventually, existing games that deal with stage fright were evaluated and compared with non-game VR application. All the knowledge gathered so far is used for designing Phobi, and the next chapter describes the details of its design.



# 4

## DESIGNING PHOBI

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While the previous chapters explored stage fright, VR, and games, the present chapter uses some of their findings to establish a set of design guidelines for the development of Phobi. The beginning of this chapter elaborates on all the guidelines to form a design manifesto. Towards the middle, the contents and the production process of Phobi are described in broader detail. The chapter ends with an assessment of the piloting of the game with a set of participants and an outline of the test results.

## 4.1

# Guidelines

This is a very good time to return to the second research question, “What kind of features could be used in a virtual reality game that seeks to alleviate stage fright and improve its player’s speaking skills?”, because design guidelines would be ideal for determining these aspects. Moreover, after they have been determined, they are implemented in Phobi.

In order to improve the convenience of the gameplay experience, Phobi incorporates the following features:

- Players can upload their own text or presentation material as a source for practising. In case players lack their own material, they can choose an existing text material or cue words offered by the game.
- The characters in the audience will be partially pre-scripted and react based on the

player's accuracy of speech, tone, pitch, volume, the timing of delivery, and body movements. This is because technological development is not sufficiently advanced to allow the virtual audience to be driven by Artificial Intelligence (AI). Hence, the audience will not be able to comprehend the exact context of a player's speech. For example, if the player makes a presentation about World War 2, the audience will have no idea about this context. In this manner, the best attempt is made to invoke and maintain a sense of presence through audience behaviour.

Apart from the above considerations, each subsection below contains guidelines related to that particular component of the project. The guidelines are divided into frameworks and options. The frameworks act as an anchor for certain options that could be potentially implemented within the game.

## Stage fright

Through knowledge gained earlier by researching into stage fright, it was inferred that the process of overcoming stage fright requires an understanding of the fear-inducing stimulus through gradual exposure to it. Some options for Phobi's gameplay are picked from the inferences and listed in the table below.

FRAMEWORK	OPTIONS
Exposure to the stimulus must be gradual and in-line with exposure therapy	<ul style="list-style-type: none"> <li>Starting the game in a small area with a handful of audience members and gradually scaling it to a large space.</li> <li>Beginning with a fun warm-up gameplay that is completely unrelated to stage fright and transitioning to simulations of different stages while the player is hooked to the game.</li> </ul>
The players require a space to question the psychological notion of fear and the very meaning of stage fright.	<ul style="list-style-type: none"> <li>Using the elements within the virtual environment to exaggerate stage fright in order to highlight its absurdity.</li> <li>Audience members could be comprised of different creatures such as predators and this type of humour could amuse players as well as counter their fear.</li> </ul>
The game can be played by those who do not suffer from stage fright or any stage anxieties.	<ul style="list-style-type: none"> <li>Providing feedback about the players' performance based on their confidence and clarity in articulation so that those who do not suffer from stage fright could play the game to improve their speaking skills instead.</li> </ul>

Table 6. Frameworks and options outlining aspects of stage fright in Phobi.

## Virtual Reality

Chapter 3 focused on VR as a medium and elaborated on its core elements. These elements enable an engaging VR experience to suspend its user's disbelief. Since VR is a new and unfamiliar medium, Phobi should be easily navigable for any player who wishes to experience and engage with it. This subsection provides options in relation to VR.

FRAMEWORK	OPTIONS
The experience must be therapeutic.	<ul style="list-style-type: none"> <li>• Displaying tutorials centered around therapy at the beginning of the game and in-between the game's levels.</li> <li>• Allowing an option that allows players to switch off Phobi immediately if they do not feel comfortable being on the artificial stage.</li> <li>• Gradually increasing the size of the audience.</li> </ul>
A sense of presence must be invoked and maintained through a clear PI and PSI.	<ul style="list-style-type: none"> <li>• Making sure that the stage is not too close to any of the walls or other non-interactable objects.</li> <li>• Creating an echo from the microphone that reverberates across the room.</li> <li>• Creating a feeling of anticipation and believability through the audience's gaze and behaviour towards the player.</li> </ul>
The VHB, VB, physical interaction, and scenario must be coherent with each other.	<ul style="list-style-type: none"> <li>• Keeping the realism low so that it would not increase a player's expectations of realistic behaviour.</li> <li>• Allowing the audience members to behave in a wacky manner so that the player frequently expects them to do so and this hides many of the glitches.</li> </ul>
First-timers and experienced VR users should be able to navigate seamlessly within the game.gate within the game.	<ul style="list-style-type: none"> <li>• Incentivizing a player to engage and feel welcomed inside the artificial environment through seamless User Interaction (UI) and User Experience (UX) design.</li> <li>• Helping first-time VR users navigate their way through clear tutorials.</li> <li>• Making the audience encourage the player while performing.</li> </ul>

Table 7. Frameworks and options outlining aspects of VR in Phobi.

## Games

Chapter 4 reviewed main elements that enhance gameplay, namely especially play, performance, motivation, flow, narrative, and humour. This subsection provides frameworks based on these elements and other ones as well.

FRAMEWORK	OPTIONS
The relationship between play and performance should be fluid.	<ul style="list-style-type: none"> <li>Enticing play as well as exploration at different stages.</li> <li>Replacing the player's body with an avatar.</li> </ul>
It would be ideal if gameplay elements encourage the player to play the game repeatedly.	<ul style="list-style-type: none"> <li>Using randomized speech material that is different to each and every player that enters the VR space.</li> <li>Encouraging players to choose from a vast variety of speech material.</li> <li>There could be plenty of levels and stages for the player to practice. Some of these could be locked for players and only revealed if their ability becomes sharper.</li> <li>Players could receive a score or points based on the accuracy and fluency of their speech.</li> <li>The audience could vary to an extent.</li> <li>Failure within the game could be very amusing.</li> </ul>
The humour within the content should be geared towards amusement and countering players' fears.	<ul style="list-style-type: none"> <li>Exaggerating many parts of the game, such as the scenarios and characters.</li> <li>Evoking humour and laughter through a few chosen levels that possess a surreal aesthetic.</li> <li>Placing unscrupulous predators and other creatures as members of the audience.</li> <li>Adding plenty of humour to the speech material.</li> <li>Lowering the player's expectations of realism through an unrealistic avatar that creates an absurdity.</li> </ul>
The narrative must provide background and orientation for the player to understand different scenarios within the game and position themselves accordingly.	<ul style="list-style-type: none"> <li>It requires clear answers to these questions:</li> <li>Why is the player/protagonist in these environments?</li> <li>Who are they speaking to and what is the context as well as the purpose of the speech?</li> <li>What is the reason behind the specific avatar of the player, and what are the interrelations between the player and their character?</li> </ul>
Rewards during gameplay should be gratifying and incentivize further play.	<ul style="list-style-type: none"> <li>Adding applause from the audience that could motivate and reward players if they speak well.</li> <li>Adding a scoring system that could provide points based on the player's confidence.</li> </ul>

Table 8. Frameworks and options outlining aspects of gameplay in Phobi.

## Process of design

These frameworks mentioned below are basic game design principles geared towards efficiency and conserving time. Nevertheless, they help in enhancing Phobi.

FRAMEWORK	OPTIONS
Rapid prototyping.	<p>Rather than building the whole game with a risk of determining that it does not work very well, it would be easier to design quick prototypes and test it with potential players before continuing with larger parts of the game.</p> <p>There is a common systems design term known as 'fail-fast' that immediately indicates any aspect of the game that is likely to fail. The design must make use of rapid prototyping and the fail-fast system to identify mistakes rather than continue a possibly flawed process.</p>
Iteration using layers.	<p>All parts of Phobi are built using a multi-layered approach with a major priority for testing. For example, a level may be built quickly with virtual blocks in order to check the scale of the virtual environment. With these blocks as a foundation, the actual elements of the game are created and iterated.</p>
Constant testing and feedback.	<p>As and when Phobi is being developed, it is tested out with willing participants to check whether their way of playing matches the intent of the design.</p>

Table 9. Frameworks outlining the process of design for Phobi.

## Phobi's manifesto

### Stage fright

The game should allow gradual exposure to the stimulus.

- Parts of the game should enable the player to question the idea of fear itself.
- The game should be engaging even for those who suffer from stage fright.

### Virtual reality

- The gameplay should have a therapeutic overtone.
- The experience must invoke and maintain a valid sense of presence.
- The experience should also be coherent.
- First time VR users should be able to navigate within the game.

### Games

- The game could be played repeatedly without significantly lowering interest.
- Subtle humour in the game could create amusement and counter fear.
- A layer of the narrative should provide a purpose for players and engage them.
- Rewards within the game should incentivize and encourage the continuation of play.

### The process of design

- A fail-fast method of rapidly prototyping the game would increase efficiency.
- The game should be built using a multi-layered approach.
- The game should be tested frequently in order to revise and iterate the design.

The above manifesto clearly answers the second research question: **What kind of features could be used in a virtual reality game that seeks to alleviate stage fright and improve its player's speaking skills?** Consequently, the contents of Phobi will be created based on the manifesto. Nevertheless, the answers to the second research question are also examined further by testing the game with a set of participants.

## 4.2 Idea

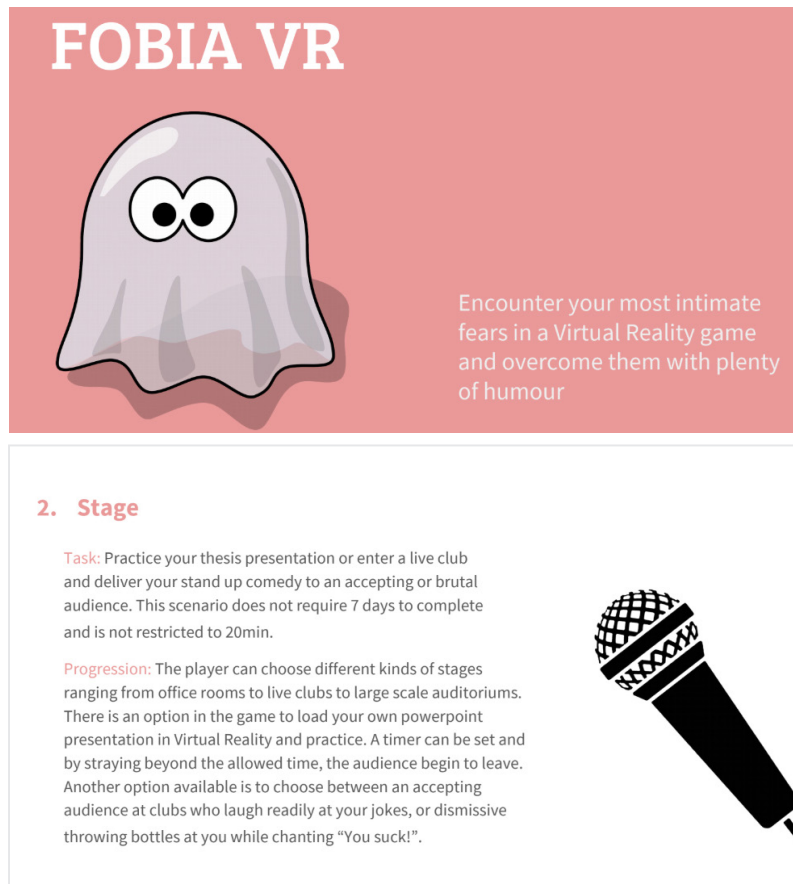


Fig 26. Pages of the application made to AVEK Digidemo.

### Origins

“Are you afraid of slimy insects & hideous rats? Rappelling down an endless gorge? Or the Queen of Timbuctoo coming home to collect your taxes? You ain’t alone. Fear no more! We produce the most whimsical Virtual Reality (VR) game to help you tackle your innermost fears”.

The previous paragraph describes my initial conception of Phobi. It was an attempt to develop a humorous game, wherein the game’s player is able to confront their fears in a hilarious manner. It was intended to be safe, secure, and most importantly, fun. Later on, the list of fears was narrowed down to focus only on the fear of public speaking or stage fright, due to this fear being the most relevant of the lot.





Fig 27. An early prototype of Phobi developed at EIA.



Fig 28. Our team at EIA, from left to right: Luka Topić, Juan Pablo Muga, Gautam Vishwanath, Sebastián Velloso, and Javier Mattatall.

## Evolution

In order to validate the idea and garner some funds for further developing the concept and prototype of Phobi, applications were made to a few organizations in Finland. Thanks to Audio-visuaalisen kulttuurin edistämiskeskus (AVEK), initial funding of 3000 Euros was received in 2018. This motivated and helped me in accelerating the process of development of the initial concept.

Later during the same year, I applied to the European Innovation Academy (EIA) held in Turin, with the aim of developing a business model for Phobi. The EIA conducted a 3-week intensive course aimed at converting an idea into a business through team formation, prototyping, and pitching ideas to Venture Capitalists (VCs). I was able to form a team with 4 other students at EIA and we began working on Phobi. Over the first week, we validated the idea of stage fright and public speaking as the most feared fear by conducting quantitative surveys online and at various locations around Turin with certain target groups. During the second week, we tried and tested existing applications, such as Virtual Speech and *Speech Center VR*, and came to the conclusion that they were neither fun nor engaging. The final week was dedicated to creating a rough rapid



Fig 29. A scene from AltSpaceVR.

prototype of Phobi and testing it with others at EIA. Despite testing it on a phone with Google cardboard and extremely low fidelity, people seemed to be immersed and felt that they were actually on stage. Because of substantial constructive feedback, I decided to continue on this project and convert it into a thesis.

## Inspirations

Here are some examples that inspired Phobi's concept, design, and aesthetic:

- *AltSpaceVR*: A social platform that provides meeting spaces in VR, where users can have conversations, watch videos, play games, and browse the Internet. This application makes use of VR for socializing and speaking to other people who are represented by their avatars. It is interesting to notice whether users could feel any social anxiety or is this aspect hidden by the avatars. Phobi attempts to implement avatars in a similar manner.
- *Comedy Night*: This is a PC game wherein players can perform live comedy or watch others perform as an audience member. If players choose to perform, they might receive favourable votes or be heckled by the audience depending on the nature of their jokes. This created an inspiration for unscrupulous audience behaviour in Phobi.



Fig 30. A scene from *Comedy Night*.



Fig 31. A scene from *Hotel Transylvania 2*.

- *Hotel Transylvania 2*: The variations in the characters and their behaviours served as an inspiration for the design of audience members as well as avatars for Phobi. Warm and fuzzy lighting during certain scenes of this movie inspired the creation of certain stages in the game.

All of these examples also contain a cartoonish aesthetic that creates a friendly as well as inviting mood.



## 4.3

# Development

### Prototyping

As per the manifesto, a quick prototype ensures a fail-fast and efficient approach. Before prototyping and creating a stage in VR, the type of stage had to be chosen. Would it be a conference room or a comedy club or perhaps a church? Having asked many of my friends, they expressed their desire to perform stand-up comedy.

I created a VR scene through a quick 3D sketch of a bar that consisted of a stage and a few lights. There was also some sample text containing jokes present for users in case they required them. Realistic looking audience members were downloaded from mixamo (n.d) and placed in the VR scene. At this stage, the audience was not very reactive nor were they responsive. They were merely present in order to capture the feeling of being on stage.

As a prototype, this scene was tested with some participants in order to witness their reactions and understand whether they felt any form of presence. On the positive side, the participants felt that they were in actually in the environment and became conscious of being judged by the audience members. However, the lack of reactions from the audience created poor PSI and was detrimental to the overall experience.

Many of the participants noted that since the audience comprised of realistic looking humans, they expected real behaviour and straightforward reactions from the audience. The lack of coherence in the scene reduced a certain amount of believability and even created motion-sickness amongst certain participants. On another note, the participants were moderately aware of their external world outside VR and were shy as well as hesitant to speak, especially due to my presence as an assistant. They also outlined that a sudden jump into the VR scene and an immediate pressure to speak felt intense and abrupt. Overall, the feedback was very valuable and allowed me to rethink some aspects of the structure of Phobi's gameplay.

For the second prototype, I aimed for some of the following changes:

- The audience members could comprise of non-human entities such as aliens in order to lower the player's expectations of realistic behaviours from them and add more humour to the overall scenario.
- The player could start slowly and gradually encounter larger stages. This process could also be accomplished through a layer of narrative or a storyline. It would also enhance gameplay.

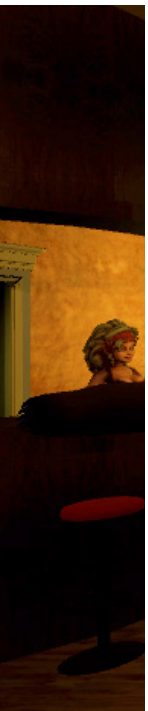
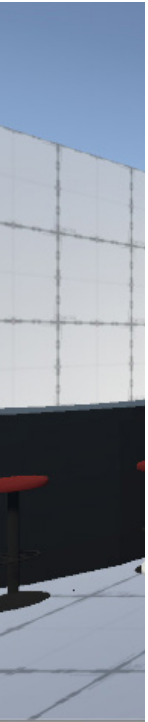




Fig 32. A White-boxed 3D sketch of the bar.



Fig 33. Gradual development with characters, textures, and lighting in the scene.

- The scenario should be coherent and this process could be achieved through a clear visual style and different audience members. The VR scene will instead appear to be more cartoonish in order to be coherent

with the non-human audience members.

The gameplay, narrative outline, and many other features of the second prototype are elaborated throughout the next few sections.

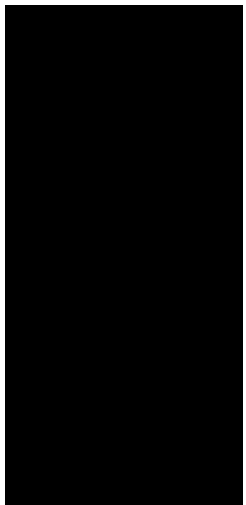
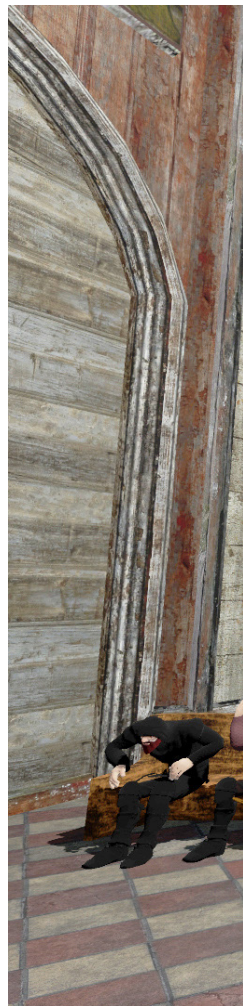




Fig 34. Rap-artist level.



Fig 35. Comedy club level.



## 4.4 Design

### Gameplay

Adhering to the manifesto, one of the core aspects of Phobi's gameplay is the ability for new VR users or gamers to seamlessly navigate their way through





Fig 36. Church level.



Fig 37. Adolescent level



Fig 38. Politician level

the simulation. Phobi is aimed to be very easy to launch and experience. All that is required for players is to wear their HMD, choose certain options in the game using their controllers, and speak. As they begin playing, the gameplay progresses gradually in order maintain a therapeutic overtone. In

this manner, it is also easier for players at the beginning, so that it draws their interest and motivation. As the game progresses over the course of many levels, the challenges within it become harder. Table 10 breakdown of different levels within Phobi's second prototype and each one's attributes:

	Adolescent	Rap-artist	Comedy club	Politician	Church
Stage	A dark area.	Pub with a stand-ing microphone.	Pub with a stand-ing microphone.	Stadium with a podium.	A church with a pulpit.
Audience	A flying jellyfish.	Predators, demons, and aliens.	Predators, demons, and aliens.	Audience seated and cheering; not visible due to them being far away.	Hooded men and women wearing religious garb.
Tasks for players	Scaring the jellyfish by shouting profanities at it.	Performing the rap song so that it is in sync with the music.	Entertaining the audience with rich jokes.	Appealing to the crowd with policy proposals or gimmicks.	Mesmerizing the congregation goers.
Obstacles	Jellyfish flies close to players and annoys them.	Music picks up the pace.	Some audience members are unscrupulous.	Speech material has been tainted by the opposition.	Powerful body postures needed to appeal to the congregation.
Rewards	Jellyfish flees.	The audience joins in the rap.	The audience members laugh at good jokes.	Crowd cheer.	Audience mesmerized.

Table 10. The columns represent the different levels in *Phobi*, and the rows indicate each level's attributes.

In each of these levels, the player stands on a stage. They can also walk within a finite area as well as move their hands. Due to this level of interactivity, immersion is aided. A sense of presence is invoked and geared to be maintained through the stage, unreachable walls, believable avatars on players, and adequate reactions from the audience. Each scenario is also aimed to be coherent through a layer of narrative, homogenous visual aesthetic, and immersive spatial audio. The overall narrative is outlined in the next subsection.

Every level mentioned earlier offers the player:

- The ability to upload their own text material or choose an existing one in the level.

- The ability to watch themselves on stage as an audience member after delivering their presentation.

The first offer is to ensure that players can use any material they like as a source for practice. They could choose an existing piece of text or simple cue words in order to practice improvisation. Certain studies have hinted that improvisation helps in enhancing creativity and thereby imagination (Gladwell, 2007; Jordanous & Keller, 2012). Practising through improvisation could boost confidence and enhance a player's public speaking skills.

The second offer is designed so that players would see themselves as avatars that speak using





*Fig 39. An example of the player watching their own presentation from the point of view of the audience.*

their recorded audio and move in the same manner players had moved during their presentation. The avatar concept was chosen for two reasons, namely to inject humour, and due to technological limitation hindering video recording. Currently, it is very hard to record a player's video during their performance in VR as the hardware limits it. Therefore, it could be more fun and engaging if players watch themselves as avatars instead with exaggerated movements that are mapped by the VR device's controllers. The distorted humorous avatars are also intended to make an artistic statement about how an audience might perceive the presenter. Nevertheless, the player can analyse their actual voice recording and improve their speech.

In Chapter 2, some Ni-Kang's (2016) hypotheses regarding audience behaviour were outlined (Ni-Kang, 2016). They stated that a parameterised audience model can generate virtual audiences with expressive behaviour,

which users are able to recognize and prefer practicing with. In addition to all the game-play elements already mentioned and to provide a parametrized audience behaviour model, Phobi's audience behaviour in each level is based on:

- The pitch, tone, and volume of the players' speech that ultimately determines their confidence.
- Clarity of their speech that measures whether players are stammering or stuttering while speaking.
- The players' body movements, which mainly checks their hand movements and discerns whether they exhibit nervousness at any time.
- The timing of players' delivery to examine whether they are speaking too fast or slow or at an appropriate speed.

Apart from these factors that are within the player's control, each audience member is

programmed to behave in a certain way depending on the level of difficulty in the game. This behaviour ranges between extreme unscrupulousness to complete devotion to the presenter. In each level, striking a balance between the player's performance and the audience's own behaviour is crucial to retain motivation for the player.

Through all the gameplay features described earlier, it could be inferred that the gameplay levels, game mechanics, and audience behaviour are in-line with Phobi's manifesto. This is because the experience of Phobi is intended to provide a gradual exposure through an increasing crowd size, maintain a valid presence, remain coherent, provide humour, and reward the player. All of these features could be bounded to a narrative that enhances the overall gameplay. The next subsection delves into the narrative of Phobi.

## Narrative

The story taking place inside Phobi is woven through a gameplay narrative that is geared to create a sense of meaning and purpose for the player. This provides a role for players and immerses them within the events taking in each scenario, thereby allowing them to momentarily forget about their fears. The narrative is also intended to aid gameplay and enhance humour.

The background to the story involves the player character as a protagonist living in an altered state of mind, wherein their world comprises of a planet inhabited by aliens,

predators, orcs, and many other non-human entities. The protagonist goes through a fast-forwarded complete life-cycle, beginning from a child all the way up to being extremely old and nearing death. In each stage of their life, the protagonist encounters a scenario, wherein they are compelled to speak in public to their fellow creatures. Here are all the stages of the protagonist's life and their main aspect intended for the final version of Phobi:

1. Baby - Learning how to speak.
2. Adolescent - Swearing all the time.
3. Young rapper - Enthusiastic and seeking fame.
4. Office worker - Needs to work in order to fit into society.
5. Stand up comedian - Mid-life crisis attempting to seek fame.
6. Politician - Basking in the glory of popularity.
7. Congregation preacher - Final stage of life.

Each one of these stages is also a level in the game comprising tasks, obstacles, and rewards. Some of these levels and the gameplay elements within them were elaborated in the earlier subsection.

Every stage of the protagonist's life is created with a Therapeutic Intent (TI) and purpose. Some elements within the narrative also provide space for players to interpret the set of events with their own imagination. Nevertheless, here is an elaborated version of all the stages along with their TI:

STAGE	ACTION	THERAPEUTIC INTENT
Baby	The protagonist is born into an altered world and is learning how to speak. Everything uttered turns into garbled gibberish.	Players begin to warm up just by uttering any words of their choice.
Adolescent	All around the protagonist are intimidating flying jellyfish that can only be shooed away by swearing at them.	Engaging in profanity just before a speech might help the player warm-up and speak better later on (Stephens, Spierer, & Katehis, 2018). The players need not engage in extremely profane language; instead, they could use milder phrases, such as “shut up” or “get the hell out of my sight”.
Rapper	As a young rap artist at a karaoke bar, the protagonist entertains an audience composed of goblins.	Karaoke with music in the background enables the player to enter into a state of flow. It also helps in freeing up and clearing the mind.
Office worker	As an office worker, the protagonist appears completely unprepared for a presentation in front of the boss and colleagues. The only way to deliver it successfully is by guessing what is in the presentation slides.	Keywords and pictures in the slides serve as an anchor or a cue for improvisation. This could trigger and strengthen the player's imagination. It would also aid in the betterment of clear articulation. This is also the first time the protagonist makes eye contact with members of the audience, i.e. their boss and colleagues. It would probably be easier to do so after all the earlier warm-ups.
Comedian	Having been fired from their previous job, the protagonist lands up as a stand-up comedian in a pub.	Once again, stand-up comedy provides room for imagination. It also focuses on the player's body movements, tone, pitch, the accuracy of speech, pace, and timing of delivery. This is perhaps a more entertaining and engaging way to practice public speaking.
Politician	As a successful comedian, the protagonist becomes very popular and uses their skill to become a politician. However, making jokes and convincing society on crucial issues may not be the same. In this stage, the protagonist speaks to a rally attended by thousands.	This would be the first time the player speaks to a mass audience. Having accumulated public speaking skills and experience earlier, the challenge might be milder. The player needs to amplify their voice and be very confident while speaking. There are also game mechanics that require the player to maintain a strong posture.
Preacher	Loathing all the deception and lies in politics, the protagonist becomes a preacher at a congregation instead. Now, the protagonist is also very old and about to die.	This stage provides an opportunity for the player to feel respected and in a position of power. At the same time, it heightens their expectations and this final stage demands a powerful speech in order to convince the congregation.

Table 11. The actions taking place in different stages of the game and the therapeutic intent behind these actions.

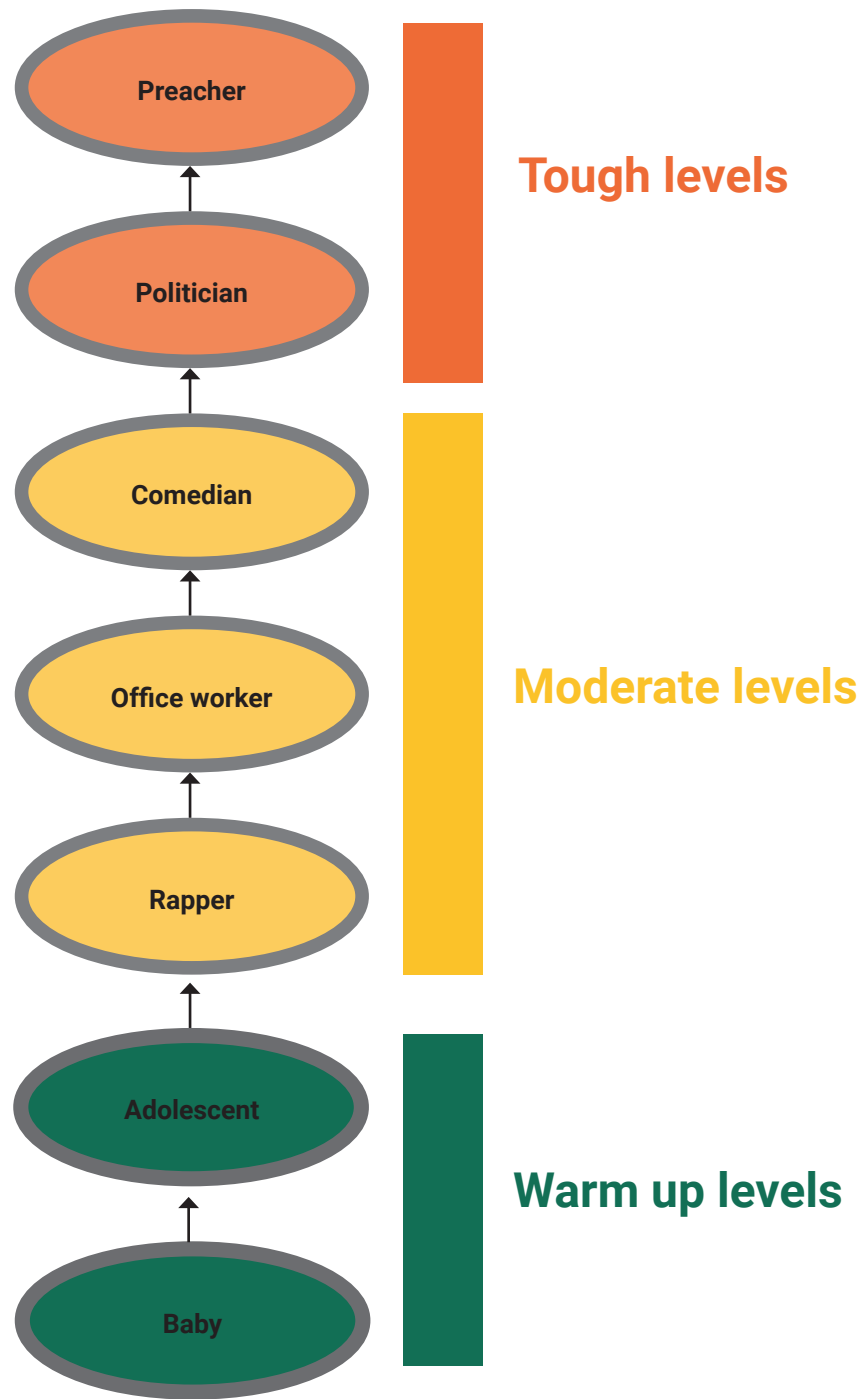


Fig 40. This systems map outlines the flow of levels and the protagonist's development in the game.

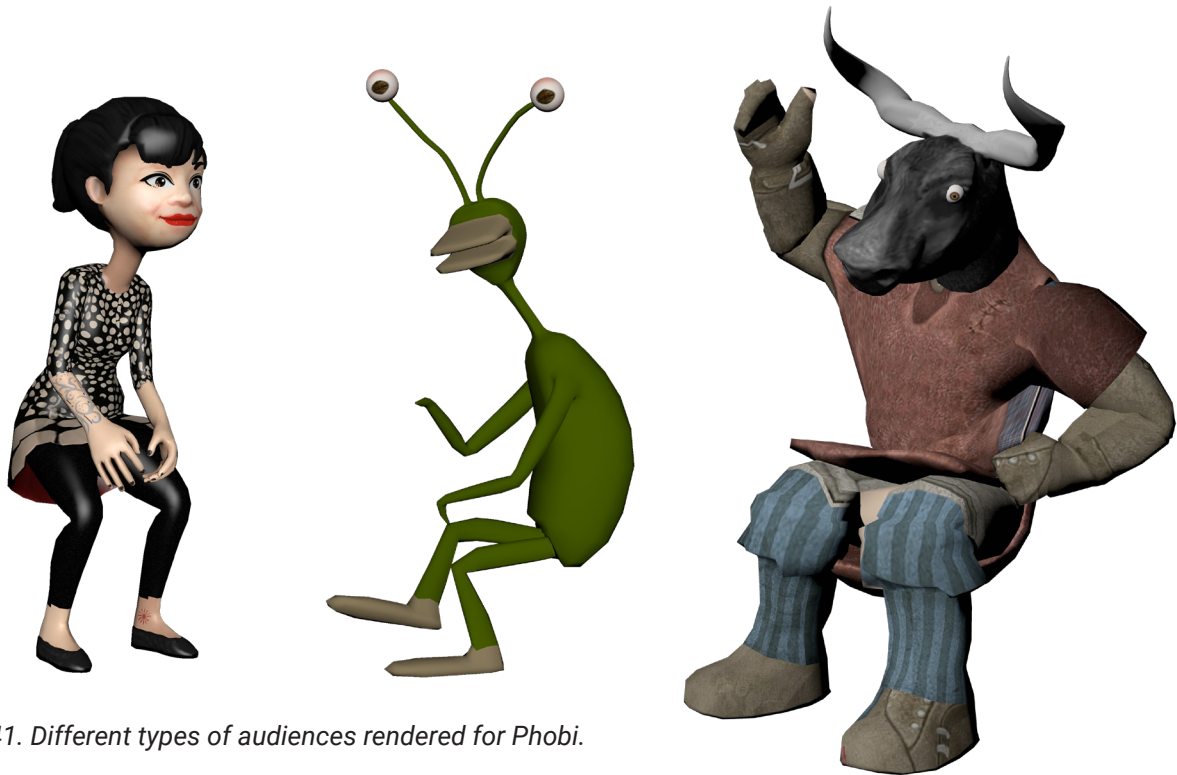


Fig 41. Different types of audiences rendered for Phobi.

## Characters

### Audience members:

The audience in Phobi relates very strongly to VHB that contributes to coherence. However, in this case, the audience members are not necessarily virtual humans. Instead, they are humanoid creatures, which may either be aliens or predators or goblins, to name a few. The reasons behind this decision go as follows:

- It creates a sense of fantasy through the whole story and adds to humour during gameplay.
- There is an artistic statement made to the game about the origins of stage fright. As mentioned earlier, stage
- It also makes an artistic statement about the worst scenario that could take place during public speaking. In reality, would the audience members ever devour and eat the presenter up?
- It also attempts to examine the idea of masks as well as avatars by observing the manner through which they alter perception while performing.
- Humanoid creatures are placed due to certain technical limitations that hin-

fright is genetically imbibed into humans due to the fear of predators and unknown creatures in caves during historic times. Usually, an urban audience would not encounter these predators, and they are instead present as an audience in VR.



*Fig 42. A VB consisting of a robe with a confident posture when the player performs as a preacher.*

der the placement of realistic humans as audience members. If there were realistic looking humans, players might anticipate certain expected behaviours to emanate from them while they speak. However, this may be hard to satisfy because of the AI not being very advanced. Due to this state, the audience cannot anticipate or understand the context of every piece of content that the player narrates.

However, there is also a drawback to non-human entities being audience members. The lack of human presence fails to mimic reality in case the players want a close-enough simulation to the actual stage where they would present. For example, if

players choose to practice for an upcoming stand-up comedy skit, their audience would comprise of real humans. Aliens in the simulation may not always help them practice for an actual situation.

#### **Player character:**

The player character's avatar relates to the VB that contributes to coherence. The avatar defines the character in the story and has an impact on how the player feels, behaves, reacts to certain situations. Here are some reasons for selecting avatars:

- It would be very interesting to examine how the player feels being inside another



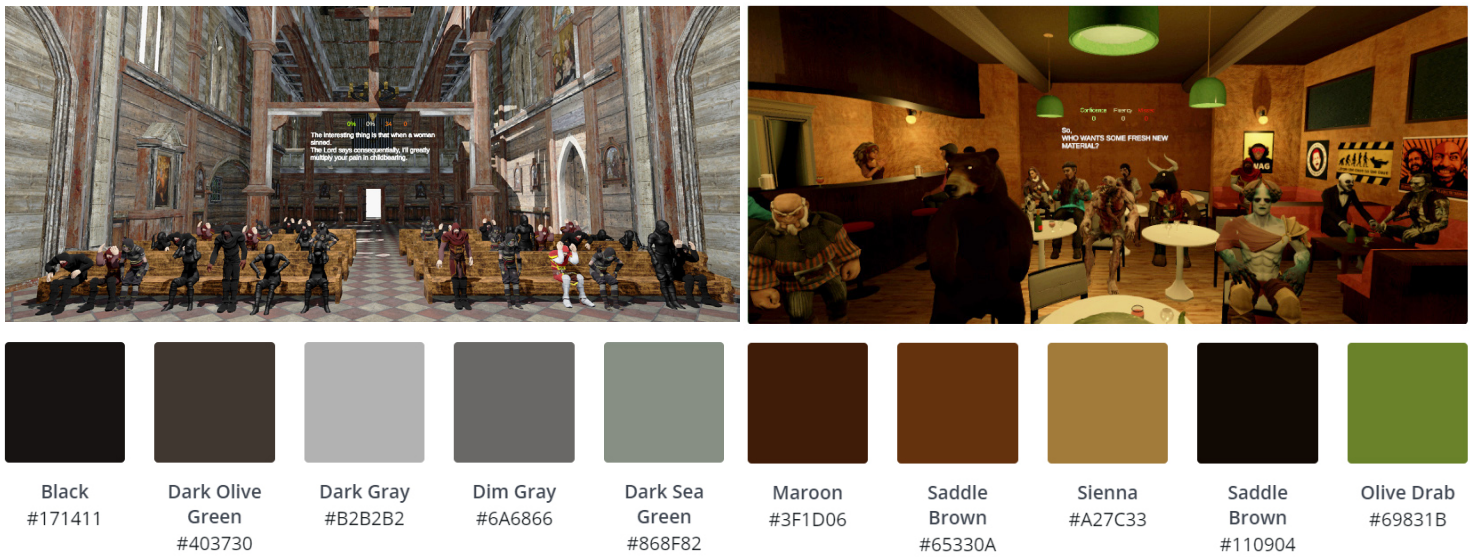


Fig 43. Colour palette comparison between the comedy club and church.

er body. As cited earlier, pretending to maintain a strong posture and being confident aids in lowering stage fright (Cuddy, Wilmuth, & Carney, 2012). This begs the question: What if the virtual avatar was a character with a strong posture? This is tested out with participants in the Church/Preacher level and assessed as to how they feel.

- The avatar makes an artistic statement about the exaggeration of behaviours when players view their own performance through an audience's perspective after the performance is complete. It also adds to humour.
- A non-human VB would be coherent

with the non-human audience and their VHBs.

- Due to hardware constraints and technical limitations, it is currently not possible to simulate the player's own body inside VR. Hence, an alternative is required and a well-designed avatar could serve as a meaningful one.

All of these aspects of narratives mentioned in this subsection potentially enriches the story and interactions by enhancing the overall gameplay. They provide the player with a sense of purpose and meaning to engage in the virtual environment. They are designed to contain elements of VRET and potentially help the player tackle their own stage fright.

## Aesthetics

The aesthetics of a VR scene plays a fundamental part in defining the scene's coherence. Each stage of the game contains a different visual style that is based on the environment, the player's role, and the narrative at that point. Here are two examples of different scenes and their aesthetic:

	Comedy Club	Church
Feeling	A small and cozy pub that is crowded in order to portray liveliness, irregularities, and wackiness.	Grandiose church with plenty of empty spaces and organized areas to portray sanctity.
Colours	Bright and vibrant colours with posters on all the walls indicating dynamism.	Faded colours indicating the last stage of the player character's life within the story.
Audience	Comprising of children, monsters, aliens, and drunkards to aid humour and enhance the player's speech. They react in unpredictable ways due to their drunkenness and their take on the player's jokes.	Composed of hooded characters that are devotees whose faces can barely be seen. This builds a sense of anticipation and mystery for the player. The hooded characters behave in a strict religious manner maintaining silence during speech and praying at times.
Audio	Chaotic space with some music in the background and the audience is constantly blabbering.	Silent space with echo emanating from the players' voice and all attention as well as respect centered on players while delivering their speech.
Player character	Avatar of a blob with tentacles all around them indicating that they are aliens themselves; this adds to the humour and is coherent with the rest of the audience.	Avatar of a priest wearing a robe that indicates simplicity, prominence, and respect.

Table 12. Comparison between the aesthetics of the comedy club and the church.

Even in the second prototype, the aesthetics are not very well refined as per my own expectations. This was due to time constraints of development and my own lack of visual design skills. It was also because of technological and hardware limitations such as constraints on the frame rate that forced compromises.



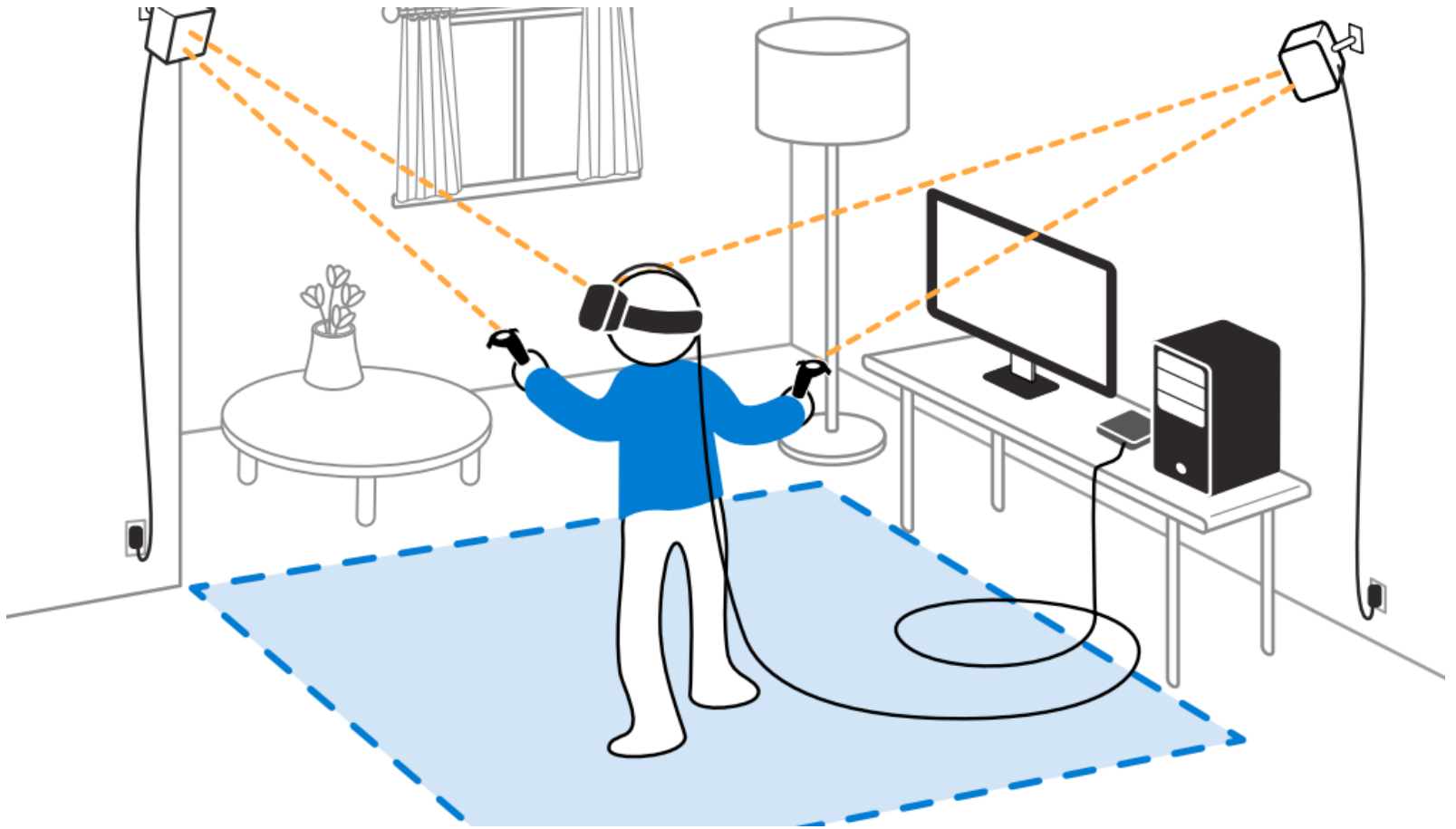


Fig 44. Blue areas signify the space within which the player can walk. The controllers in the player's hands add greater interactivity.

## Technology

### Hardware

Currently, Phobi is being developed for the *HTC Vive 2.0* VR HMD. It works when connected to a Desktop PC running an *Nvidia GTX 1080* as the graphics card. Based on past experiences encountered, these configurations provide steady to high degrees of immersion. The Vive also allows for room-scaling, wherein the player can physically move within a defined area.

### Software

Phobi is being developed on the *Unity Engine*, currently running on the version Unity 2018.3.8f professional edition. All the game mechanics, environment, and features have been programmed on my own. Most of the art assets within the game have been created by me, and a handful of them are copyright-free place holders placed temporarily for testing purposes.

A major component of Phobi is its appli-

cation of Speech-To-Text algorithms. Through the use of speech recognition, Phobi is able to interpret words narrated by the player along with the volume, tone, and pitch of their voice. For example, the audience members detect what the player is saying and interpret the speech.

Technically, each word or sentence narrated by the player is converted into a string format and each audience member is assigned a behaviour when it matches the particular string variable. This is also compounded with other variables, such as the volume and the tone of voice.

At the moment, very few games make use of the speech recognition technology, largely because the technology is still new and developing. This technology is also unexplored to an extent, and many times unreliable. Phobi implements a mixture of *Windows Cortana Speech*, *IBM's Watson SDK*, and the *Google Cloud Speech Service*. Each one of these services provides a plugin that can be incorporated into Unity. There are several advantages and disadvantages each plugin offers and the table below lists them out:

	Windows Cortana speech to text	IBM's Watson speech to text	Google Cloud speech service
Accuracy	Very accurate	Often inaccurate	Very accurate
Detecting accents	Very accurate	Often inaccurate	Accurate
Streaming (Speed of recognition)	Slow	Very fast	Slow
Accessibility	Works only on Windows OS	Works on Windows and Mac	Works on Windows and Mac

Table 13. Comparison between different speech recognition services used in Phobi.

By using all the plugins in the game, the best advantage of each service is made. However, this could also lead to certain complications, such as a drop in the frame-rate.

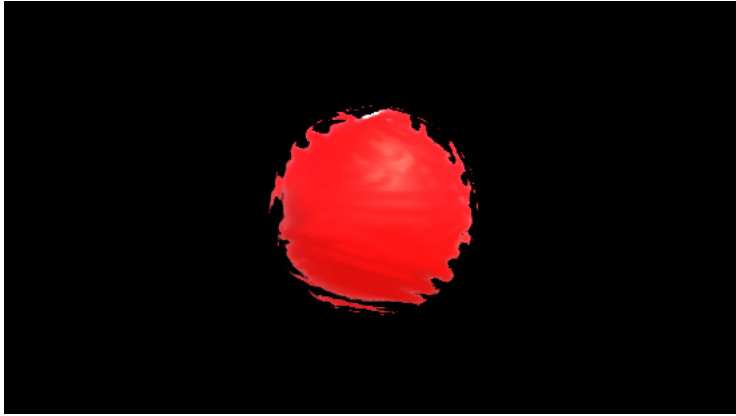
Maintaining adequate frame-rate is often a substantial challenge for game designers. The process could lead to compromises within the design. The ideal frame-rate for a VR simulation is 90.0 frames per second; anything significantly below this margin leads to jitter and even motion sickness. In order to maintain this frame-rate, the Google Cloud Speech plugin had to be shelved since it had significantly lower advantages compared to the other plugins. Another technique used was cutting down the number of polygons in many of the models, having baked lighting in as many areas as possible, and using occlusion culling for the camera. Through this manner, the design of Phobi accommodated various technological limitations.

This whole section delved into the contents of Phobi. Currently, these contents constitute the second prototype of Phobi and they are tested out. The prototype also touches upon the first research question by examining aspects of narratives, characters, and humour. The second research question is examined by testing the second prototype and collecting data from these tests.

## 4.5 Assessment

### Testing

The second prototype contains multiple levels wherein the player performs as a teenager, rap artist, standup comedian, politician, and a preacher. For the test sessions, players were allowed to use their own speech material as long as it aligned with the theme of the level. For example, they could practice a political speech in the level where they perform as a politician. In case they did not possess their own material, the game provided options for them to choose an existing one. The players were told that they could skip any level by tapping a red virtual bubble placed next to them in the simulation.



*Fig 45. The red bubble that the player can tap to skip a level or quit the game*

The test sessions were held at the Virtual Reality Hub in Aalto University, Helsinki. As an isolated space, the players were able to practice undisturbed in the hub, with the exception of me serving as an assistant in case they needed any form of help. Consent was taken from all the players to monitor their gameplay and use their answers to the interviews for this thesis.

The tests were carried out with a total of 7 players and they were interviewed. The consent form and shortened answers to these questions are attached in the appendix.

## Interview questionnaire

Interviews are conducted with players in order to assess the impact of Phobi and the design guidelines that broadly answer the second research question. These

interviews are meant for players to talk about their overall experience with Phobi. Hence, the interviews are semi-structured because they include a set of questions that are connected to the main topic while providing freedom for interviewees to freely express their own ideas. This process generates new perspectives to the project, and it opens up areas for measuring the validity of the design guidelines (Portigal, 2013, p.3).

The questions in the semi-structured interviews are oriented around the second research question, “What kind of features could be used in a virtual reality game that seeks to alleviate stage fright and improve its player’s speaking skills?” and the established design guidelines that seek to answer it. Table 14 shows the questions and the intent behind asking them:

CATEGORY	QUESTION	INTENT
General	Profession.	To gather their field of work.
	Age group options: 15-23, 24-35, , 36-44, 45+, Prefer not to reveal.	To find out their age group.
	Native language.	To measure the fluency of the participants' speech in relation to their accent and to examine whether the speech recognition services are accurate in detecting multiple accents.
	Experience with VR.	To see how much experience participants have with VR.
Stage fright	How often do you give presentations or speak to an audience?	Checking how much the participant engages in public speaking. This question is asked before the test begins.
	Do you feel any sort of anxiety or nervousness before beginning a presentation? Scale of 1 to 5.	To note their previous experiences with stage fright. This question is asked before the test begins. This question is asked before the test begins.
	What do you normally do to alleviate your stage fright before going on stage?	To examine some methods which they already use. This question is asked before the test begins.
	Were you nervous being on stage at any point of the game?	Checking their stage fright in VR and measure their sense of presence.
Virtual reality	If you had the opportunity to practice in a VR environment before any of your real presentations, would you use this approach?	Understanding whether they are willing to use VR for tackling stage fright and practicing speeches.
	What would be the main difference with that compared to other approaches you've used earlier?	Validating the sense of presence.
	How easy or difficult was it to interact or navigate within the game?	Checking the usability of the game.
	How strongly did you feel that you were inside the environment where you are presenting? Scale of 1 to 5.	Measuring the sense of presence.
Games	How did you feel about the development of levels in the game?	Checking whether the exposure to the stimulus is gradual and whether gameplay progression is adequate.
	What did you feel about the audience members in the scenes?	Checking presence and coherence. Examining whether players find humour and amusement within the gameplay and audience reactions.
	What did you feel about your role and your avatar in the levels?	To see how VB impacts coherence, humour.
	How entertaining was the gameplay?	Examining players' motivation, state of flow, and humour.
	What aspects of the game did you find to be the most interesting?	Understanding what players really liked about the game and what works well.
	What aspects did not work very well?	Limitations of the game.
	Do you think a game like Phobi would help people alleviate their stage fright in any manner?	Conclusion to this whole approach and broad validation of the research question.

Table 14. The semi-structured interview questions asked before the participants and the reasoning behind these questions.



Fig 46. Participants testing Phobi's second prototype.

The questions are not necessarily in the order mentioned above. This is because the focus of certain topics could deviate based on the responses given. Some of these questions attempt to receive short answers while others are open-ended questions seeking wider explanations and generating new ideas. Specific answers to each question are mentioned in the appendix.

Before starting the tests, participants were asked to sign a consent form that is elaborated in the appendix. They were also asked to freely criticize any part of the game and not be favourably biased towards me as the creator. The participants were told that they could remove their HMD in case they felt uncomfortable during any stage of the process.

## Highlights

All the participants described themselves as being 'immersed' in different stages of the experience, thus validating their sense of presence. During certain levels, most of the participants were nervous while practising; this also validated their sense of presence and proved that their stage fright can easily be replicated in an artificial environment. Some of the

audience members such as the predators felt intimidating to the participants; this aspect moderately attributed to a strong coherence in certain scenes. Most players felt empowered and confident when they took on the role of the preacher with its avatar maintaining a powerful pose. All the participants clearly noted that VR would be a very useful tool for them to practice public speaking. They also found parts of Phobi to be very entertaining and mentioned that a combination of gaming with humour is motivating as well as effective. On the other hand, the audience behaviour is inaccurate at times and this puzzled some of the participants by momentarily breaking their sense of presence.

The participants' responses somewhat validated Phobi's manifesto. Parts of the game that did not work well could be improved in the future. Overall, a VR game such as Phobi serves the potential to alleviate stage fright and improve its player's public speaking skills.

The second prototype of Phobi can be downloaded for free by clicking on this link:

<https://bit.ly/2G5THG4>

It requires a desktop or a laptop connected to an HTC Vive 2.0 VR HMD and a microphone to play.

# 5

## DISCUSSION

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# 5.1

## Summary

Phobi is a VR game that aims to tackle stage fright. This is done by gradually exposing its players to their fears and helping them understand as well as overcome it. The game calculates the players' pitch, tone, volume, pace, clarity of speech, body movements, and the timing of their delivery of the speech. Using these calculations, feedback is provided to the players in the form of audience behaviours and data.

At many points of the game, the player can upload their own presentation or choose an existing speech material. This allows them to practice improvisation using cue words and other anchors. Moreover, levels within the game are designed so that it is easy for the player at the beginning and gradually become harder. This type of design aligns with VRET, and it instils motivation and creates a state of

flow for players.

Phobi contains a storyline that takes place in a different world composed of non-human creatures. The player takes on the role of the protagonist passing through different stages of life that require public speaking. Their audience is composed of aliens, predators, and goblins. Therefore, a narrative provides a sense of purpose and meaning for players going through the gameplay.

Lastly, Phobi is designed to contain humour as an overtone. Humour serves as a potential to counter stage fright and engage the player even more. All of the elements mentioned in this subsection are designed to make the experience engaging and assist in gradual alleviation of stage fright.



## 5.2

# Limitations

### Research

This thesis attempted to provide a comprehensive and relevant overview of all the elements related to the research, however, these fields are quite extensive and new. Some aspects of stage fright, virtual reality, and games have been examined with a very narrow framework based on personal decisions. Insufficient research regarding VRET games that tackle stage fright has hindered a thorough literature review and analysis. Overall, more research is required to understand the psychology behind stage fright, VR as an emerging medium, and the effectiveness of games.

### Phobi as a game

At this stage, Phobi is merely a prototype that requires considerable development. A large part of its contents is not very smooth or polished. A major part of its aesthetics and visual design are not complete and this affects the coherence while experiencing it. Apart from these flaws, there are many technical problems that hinder speech detection. This is because some of the speech recognition technologies are very new and are currently undergoing development.

At many points of the game, the audience

members are not very reactive or responsive. This affects player behaviour and momentarily breaks their sense of presence. Moreover, the avatar did not make too much difference to players since they hardly received any chance to observe their avatar's body in VR. Most of the time, players were reading speech material placed in front of them and never looked down to notice their avatar. Many of the players also mentioned that it was very difficult to make eye contact with audience members because they were focused on the speech material all the time.

There were many other tiny flaws in the design that hindered Phobi's gameplay. All of the defects mentioned earlier could be corrected for future versions of Phobi. They do not necessarily require a deviation from the manifesto.

### Testing

One major limitation of the evaluation component of this thesis is the relatively small number of participants in the tests. Based on this factor, it is doubtful whether a repeated test would yield similar results. Moreover, the test environment was not ideal because it constantly required my presence as an intervener in order to assist players through the game.

# 5.3

## Future outlook

### Recommendations to the design

In the attempt to find ways to alleviate stage fright and improve public speaking through VR, this thesis has provided some answers, but in the process, has raised even more questions and ideas. Using many of these ideas, Phobi's manifesto could be strengthened and tuned to make it even more detailed and focused. This would enhance the design and gear it towards the intended goals of gradually alleviating stage fright.

Some of the speech recognition technologies applied in Phobi are new and not very advanced. They are predicted to become more accurate, and it should be seamlessly integrated with Phobi's design. AI is also an advancing field and could be used to enhance the audience behaviour.

It is very difficult to design and develop Phobi single-handedly; a team is required in order to accelerate content creation and reduce some my burden. Working with team members who hold the same vision would also ensure that all of us are constantly engaged and motivated.

### Accessibility

After the design and aesthetics are improved to a certain point, an 'alpha version' of Phobi could be tested out with a certain audience. Later on, Phobi will be upload to several gaming platforms, such as Steam and itch.io. This would ensure that it is available to a large audience and is easily accessible. Seperate versions of Phobi could be created so that they are specifically tuned for corporates and academia. Our team could collaborate with them and design custom scenarios tailored to their specific needs.

# 6

## CONCLUSIONS

## **How can virtual reality enable safe and accessible ways of experiencing stage fright as well as alleviate the condition by improving public speaking skills?**

This question can be broken down to its key elements and answered with the following:

- **Safe:** VR is one of the safest mechanisms for a person to encounter their fear-inducing stimulus because the environment within VR is not real. In case certain users are feeling unsafe within a VR experience, they can easily end it by removing their HMD.
- **Accessible:** There are many commercial VR applications and games that can be downloaded very easily and experienced within the comfort of a user's own home. These applications are geared towards therapy without the requirement of a therapeutic intervener.
- **Alleviate the condition:** Gradual exposure to the stimulus using aspects of VRET leads to systematic desensitization and substantial progress in countering the fear. This is possible if the VR experience maintains a sense of presence and is very coherent.
- **Improving public speaking:** Repeated practice within the VR environment in front of a virtual audience is a wonderful way to improve public speaking. A well-designed VR game is capable of motivating its players to practice repeatedly by rewarding them when they overcome certain obstacles and make progress.

In this manner, virtual reality can enable safe and accessible ways of experiencing stage fright, and alleviate the condition by improving public speaking skills.

## **What kind of features could be used in a virtual reality game that seeks to alleviate stage fright and improve its player's speaking skills?**

There are many features that could be implemented within a virtual reality game, such as Phobi. Most importantly, the game must maintain a therapeutic overtone that allows gradual exposure to the stimulus, and parts of the game should enable players to question the notion of fear itself. Moreover, the overall VR experience must invoke and maintain a valid sense of presence as well as coherence. First-timers and experienced VR users should be able to navigate smoothly within the game. The design must ensure that Phobi can be played repeatedly without significantly lowering the players' interest. This could be done by rewarding the player for improving their skills. Within the game, subtle humour should be geared to create amusement for players and counter their fear. Furthermore, a storyline combined with layers of narratives provide a purpose for players and engages them. Phobi attempts to incorporate all these aspects, and this approach enhances its gameplay. Eventually, Phobi is geared towards alleviating its players' stage fright and improving their speaking skills through frequent practice in VR.

These features can be seen in Phobi's second prototype, and it is available for download here: <https://bit.ly/2G5THG4>

# REFERENCES

Anderson, P. L., Price, M., Edwards, S. M., Obasaju, M. A., Schmertz, S. K., Zimand, E., & Calamaras, M. R. (2013). Virtual reality exposure therapy for social anxiety disorder: A randomized controlled trial. *Journal of Consulting and Clinical Psychology*, 81(5), 751–760. <https://doi.org/10.1037/a0033559>

Ayres, J. (1986). Perceptions of speaking ability: An explanation for stage fright. *Communication Education*, 35(3), 275–287. <https://doi.org/10.1080/03634528609388350>

Barrett, H. C. (2015). Adaptations to Predators and Prey. In *The Handbook of Evolutionary Psychology* (pp. 200–223). Retrieved from <https://onlinelibrary.wiley.com/doi/abs/10.1002/9780470939376.ch7>

Beattie, J. (1778). On laughter and ludicrous composition. In J. Beattie (Ed.), *Essays*. London: E. & C. Dilly

Bender, J. D. (2016). *Duration of Time Spent Playing Online Video Games, Interpersonal Skills, and Introversion Personality Traits as Predictors for Social Anxiety Symptoms*.

Berkun, S. (1733). *Confessions of a Public Speaker by Scott Berkun*. O'Reilly Media.

Bishop, P. J. (2005). *Fright at the Improv: The Fear of Public Speaking as a Social Phobia*. 47.

Brennan, D. (2017, April 11). “Tornuffalo” Shows What Full-body VR Gaming Could Look Like with Vive Trackers – Road to VR. Retrieved April 13, 2019, from <https://www.roadtovr.com/tornuffalo-shows-full-body-vr-gaming-look-like-vive-tracker/>

Bruce, M., & Regenbrecht, H. (2009). A virtual reality claustrophobia therapy system - implementation and test. *2009 IEEE Virtual Reality Conference*, 179–182. <https://doi.org/10.1109/VR.2009.4811020>

Bruskin Associates, R. . (1973). What are Americans afraid of? (p. 53).

Buijzen, M., & Valkenburg, P. M. (2004). Developing a Typology of Humor in Audiovisual Media. *Media Psychology*, 6(2), 147–167. [https://doi.org/10.1207/s1532785xmep0602\\_2](https://doi.org/10.1207/s1532785xmep0602_2)

Caddy, B. (2017). How tech is making virtual reality more accessible. Retrieved April 13, 2019, from TechRadar website: <https://www.techradar.com/news/how-tech-is-making-virtual-reality-more-accessible>

Caillois, R. (1961). *Man, play, and games*. New York: Free Press of Glencoe.

Chapman Survey of American Fears, Wave 1. (2014). Retrieved April 6, 2019, from [http://www.thearda.com/Archive/Files/Analysis/CSAF2014/CSAF2014\\_Var206\\_1.asp](http://www.thearda.com/Archive/Files/Analysis/CSAF2014/CSAF2014_Var206_1.asp)

Cherones, T. (1993, May 20). Seinfeld. In *The Pilot*.

Chirico, A., Ferrise, F., Cordella, L., & Gaggioli, A. (2018). Designing Awe in Virtual Reality: An Experimental Study. *Frontiers in Psychology*, 8. <https://doi.org/10.3389/fpsyg.2017.02351>

Clifford, C. (2016, October 11). 13 ways to overcome your fear of public speaking and win the room. Retrieved September 9, 2018, from <https://www.cnn.com/2016/10/11/13-ways-to-overcome-your-fear-of-public-speaking-and-win-the-room.html>

Csikszentmihalyi, M. (1990). Flow: The Psychology of Optimal Experience. *Journal of Leisure Research*, 24(1), 93–94.

Csikszentmihalyi, M. (2002). *Flow: The Psychology of Happiness: The Classic Work on How to Achieve Happiness*. Rider.

Cuddy, A. J., Wilmoth, C. A., & Carney, D. R. (2012). *The benefit of power posing before a high-stakes social evaluation*.

Dave Guin, & TEDx Talks. (2015). *Why do we fear public speaking? | Dave Guin | TEDxCPP*. Retrieved from <https://www.youtube.com/watch?v=kApynzDZSVE>

Dormann, C., & Biddle, R. (2009). A Review of Humor for Computer Games: Play, Laugh and More. *Simulation & Gaming*, 40(6), 802–824. <https://doi.org/10.1177/1046878109341390>

Dwyer, K. K., & Davidson, M. M. (2012). Is Public Speaking Really More Feared Than Death? *Communication Research Reports*, 29(2), 99–107. <https://doi.org/10.1080/08824096.2012.667772>

Engström, H. (2014). *SERIOUS GAMES FOR OVERCOMING PHOBIAS The Benefits of Game Elements Master Degree Project in Informatics*.

Esposito, J. (n.d.). Conquering Stage Fright | Anxiety and Depression Association of America, ADAA. Retrieved September 9, 2018, from <https://adaa.org/understanding-anxiety/social-anxiety-disorder/treatment/conquering-stage-fright>

Fear. (2019). In *Wikipedia*. Retrieved from <https://en.wikipedia.org/w/index.php?title=Fear&oldid=891507138>

Fernandes, O., Portugal, L. C. L., Alves, R. C. S., Campagnoli, R. R., Mocaiber, I., David, I. P. A., ... Pereira, M. G. (2013). How you perceive threat determines your behavior. *Frontiers in Human Neuroscience*, 7. <https://doi.org/10.3389/fnhum.2013.00632>

Fine, D. (2013, November 20). Ten Tips to Stop the Trauma of Stage Fright. Retrieved



from Huffington Post website: [https://www.huffingtonpost.com/debra-fine/public-speaking\\_b\\_4306661.html](https://www.huffingtonpost.com/debra-fine/public-speaking_b_4306661.html)

Gabbard, G. O. (1983). Further contributions to the understanding of stage fright: narcissistic issues. *Journal of the American Psychoanalytic Association*, 31(2), 423–441. <https://doi.org/10.1177/000306518303100203>

Garcia-Palacios, A., Hoffman, H., Carlin, A., Furness, T. ., & Botella, C. (2002). Virtual reality in the treatment of spider phobia: a controlled study. *Behaviour Research and Therapy*, 40(9), 983–993. [https://doi.org/10.1016/S0005-7967\(01\)00068-7](https://doi.org/10.1016/S0005-7967(01)00068-7)

Göbl, B., Hlavacs, H., Hofer, J., Müller, I., Müllner, H., Schubert, C., ... Sprung, M. (2015). MindSpace: A Cognitive Behavioral Therapy Game for Treating Anxiety Disorders in Children. In K. Chorianopoulos, M. Divitini, J. Baalsrud Hauge, L. Jaccheri, & R. Malaka (Eds.), *Entertainment Computing - ICEC 2015* (pp. 463–468). Springer International Publishing.

Genard, G. (2016, June 19). 10 Fast and Effective Ways to Overcome Stage Fright. Retrieved September 9, 2018, from <https://www.genardmethod.com/blog/10-fast-and-effective-ways-to-overcome-stage-fright>

Gladwell, M. (2007). *Blink: The Power of Thinking Without Thinking* (1 edition). New York: Back Bay Books.

Grönroos, A.-M. (2013). *Humour in Video Games: Play, Comedy, and Mischief*. Retrieved from <https://aaltodoc.aalto.fi:443/handle/123456789/10347>

Hamayon, R. (2017). *Why We Play: An Anthropological Study*. Hau Books Chicago.

How to Overcome Stage Fright. (n.d.). Retrieved September 9, 2018, from wikiHow website: <https://www.wikihow.com/Overcome-Stage-Fright>

Huizinga, J. H. (1980). *Homo ludens*. Routledge & Kegan Paul.

Jerald, J. (2015). *The VR Book: Human-Centered Design for Virtual Reality*. Morgan & Claypool Publishers.

Jordanous, A., & Keller, B. (2012). What makes musical improvisation creative? *Journal of Interdisciplinary Music Studies*, 6(2), 151–175.

Kang, N. (2016). *Public speaking in virtual reality: Audience design and speaker experiences*.

Lee, C. (2018, January 9). How to overcome stage fright. Retrieved September 9, 2018, from Chengeer Lee website: <https://medium.com/@chengeerlee/how-to-overcome-stage-fright-2dc75bb11e0b>

Leland, K. T. (2017, June 8). New Research Shows That Cursing Can Help You Be a Better Public Speaker. Retrieved April 6, 2019, from Inc.com website: <https://www.inc.com/karen-tiber-leland/new-research-shows-that-cursing-can-help-you-be-a-better-public-speaker.html>

Levy, F., Leboucher, P., Rautureau, G., Komano, O., Millet, B., & Jouvent, R. (2016). Fear of falling: efficacy of virtual reality associated with serious games in elderly people. *Neuropsychiatric Disease and Treatment*, 12, 877–881. <https://doi.org/10.2147/NDT.S97809>

Marks, I. fM., & Nesse, R. M. (1994). Fear and fitness: An evolutionary analysis of anxiety disorders. *Ethology and Sociobiology*, 15(5), 247–261. [https://doi.org/10.1016/0162-3095\(94\)90002-7](https://doi.org/10.1016/0162-3095(94)90002-7)

McConachie, B. (2011). An evolutionary perspective on play, performance, and ritual. *TDR/ The Drama Review*, 55(4), 33–50.

McGonigal, J. (2011). *Reality Is Broken: Why Games Make Us Better and How They Can Change the World*. Penguin Books.

McGraw, A. P., & Warren, C. (2010). Benign Violations: Making Immoral Behavior Funny. *Psychological Science*, 21(8), 1141–1149. <https://doi.org/10.1177/0956797610376073>

Mishra, S. (2014, October 2). 5 Ways To Overcome Stage Fright. Retrieved September 9, 2018, from Lifehack website: <https://www.lifehack.org/articles/communication/5-ways-overcome-stage-fright.html>

Morreall, J., & Mankoff, R. (2009). *Comic Relief: A Comprehensive Philosophy of Humor* (1st edition). Chichester, U.K. ; Malden, MA: Wiley-Blackwell.

Munger, D. I. (1974). *A Decade of Stage Fright Research (1960-1969): A Synthesis*.

Niechwiadowicz, K. (2017). *Virtual Reality and Game Mechanics in Generalized Social Phobia Treatment*.

Performance | Definition of performance in English by Oxford Dictionaries. (n.d.). Retrieved April 13, 2019, from Oxford Dictionaries | English website: <https://en.oxforddictionaries.com/definition/performance>

Pertaub, D.-P., Slater, M., & Barker, C. (2002). An Experiment on Public Speaking Anxiety in Response to Three Different Types of Virtual Audience. *Presence: Teleoperators and Virtual Environments*, 11(1), 68–78. <https://doi.org/10.1162/105474602317343668>

Plato. (2008). *Philebus*. Arc Manor.

Portigal, S. (2013). *Interviewing Users: How to Uncover Compelling Insights* (1st edition). Brooklyn, New York: Rosenfeld Media.

Rock Band VR. (n.d.). Retrieved April 12, 2019, from Oculus website: <https://www.oculus.com/experiences/rift/744866972281509/>

Samson, A. C., & Gross, J. J. (2012). Humour as emotion regulation: The differential consequences of negative versus positive humour. *Cognition and Emotion*, 26(2), 375–384. <https://doi.org/10.1080/02699931.2011.585069>

Seliger, M. , & Hahn, Y. (2015). *Thesis Design. Research Meets Practice in Art and Design Master's Theses*. Helsinki: Aalto ARTS Books.

Speech Center VR. (2015). Retrieved April 6, 2019, from Oculus website: <https://www.oculus.com/experiences/gear-vr/1059383670741232/>

Skarbez, R., Neyret, S., Brooks, F. P., Slater, M., & Whitton, M. C. (2017). A Psychophysical Experiment Regarding Components of the Plausibility Illusion. *IEEE Transactions on Visualization and Computer Graphics*, 23(4), 1369–1378. <https://doi.org/10.1109/TVCG.2017.2657158>

Slater, M. (2009). Place illusion and plausibility can lead to realistic behaviour in immersive virtual environments. *Philosophical Transactions of the Royal Society B: Biological Sciences*, 364(1535), 3549–3557. <https://doi.org/10.1098/rstb.2009.0138>

Slater, M., Pertaub, D.-P., Barker, C., & Clark, D. M. (2006). An experimental study on fear of public speaking using a virtual environment. *CyberPsychology & Behavior*, 9(5), 627–633.

Stănică, I.-C., Dascălu, M.-I., Moldoveanu, A., & Moldoveanu, F. (2017). An Innovative Solution Based on Virtual Reality to Treat Phobia. *International Journal of Interactive Worlds*, 1–13. <https://doi.org/10.5171/2017.155350>

Stage Presence on Steam. (n.d.). Retrieved April 12, 2019, from [https://store.steampowered.com/app/391640/Stage\\_Presence/](https://store.steampowered.com/app/391640/Stage_Presence/)

Stapleton, A. (2004). *Serious games: Serious opportunities*. Presented at the Australian GameDevelopers' Conference.

Stephens, R., Spierer, D. K., & Katehis, E. (2018). Effect of swearing on strength and power

performance. *Psychology of Sport and Exercise*, 35, 111–117.

Steptoe, A., Malik, F., Pay, C., Pearson, P., Price, C., & Win, Z. (1995). The impact of stage fright on student actors. *British Journal of Psychology*, 86(1), 27–39. <https://doi.org/10.1111/j.2044-8295.1995.tb02544.x>

Tillfors, M., Carlbring, P., Furmark, T., Lewenhaupt, S., Spak, M., Eriksson, A., ... Andersson, G. (2008). Treating university students with social phobia and public speaking fears: Internet delivered self-help with or without live group exposure sessions. *Depression and Anxiety*, 25(8), 708–717. <https://doi.org/10.1002/da.20416>

Tull, M. (2018, October 1). How to Overcome Speaking in Public If You Have PTSD. Retrieved April 6, 2019, from Verywell Mind website: <https://www.verywellmind.com/coping-with-fears-of-public-speaking-2797220>

Ventis, W. L., Higbee, G., & Murdock, S. A. (2001). Using humor in systematic desensitization to reduce fear. *The Journal of General Psychology*, 128(2), 241–253. <https://doi.org/10.1080/00221300109598911>

VirtualSpeech - Soft Skills Training with VR. (n.d.). Retrieved April 13, 2019, from <https://virtualspeech.com>

VirtualSpeech - VR Courses. (2016). Retrieved April 6, 2019, from Oculus website: <https://www.oculus.com/experiences/gear-vr/1093617717347270/>

Virtual Orator. (n.d.). Retrieved April 13, 2019, from <https://publicspeaking.tech/>

Whitehurst, E. B. (2014). *Those who laugh, last: Exploring the use of humor as a vehicle of healing through personal reflection, theory, and practice*.

Wrench, J. S. (2011). *Stand Up, Speak Out The Practice and Ethics of Public Speaking*. Flat World Knowledge.

# MEDIA LIST

This list includes all the VR applications, games, and films cited in this research.

## VR applications

AltspaceVR—The Social VR App [Computer software]. (2015). Redwood City, CA: AltspaceVR.

Bravemind [Computer software]. (2005). Los Angeles, CA: USC Institute of Creative Technologies.

Speech Center VR [Computer software]. (2015). San Francisco, CA: Cerevrum, Inc.

Virtual Orator [Computer software]. (2016). Vinohrady, Czechia: Virtual Human Technologies.

Virtual Speech [Computer software]. (2016). London, UK: VirtualSpeech Ltd.

## Games

Civilization [Video game series]. (1991-Ongoing). Sparks, MD: Firaxis Games.

Comedy Night [Video game]. (2017). Durban, South Africa: Lighthouse Games Studio.

Goat Simulator [Video game]. (2014). Skövde, Sweden: Coffee Stain Studios.

Mindspace [Video game]. (2015). Vienna, Austria: University of Vienna, Research Group Entertainment Computing.

Rick and Morty: Virtual Rick-ality [Video game]. (2017). Austin, TX: Owlchemy Labs.

Rock Band VR [Video game]. (2017). Boston, MA: Harmonix.

Stage Presence [Video game]. (2017). Manchester, UK: Sea Green Games.

The Talking Dead [Video game]. (2018). Pittsburgh, PA: Carnegie Mellon University.

Tornuffalo [Video game]. (2016). Las Vegas, NV: RealityRig.

## Films

Roiland, J. (2013-2017). *Rick and Morty*.

Tartakovsky, G. (2015). *Hotel Transylvania 2*.



# IMAGE SOURCES

Fig 1. Own material.

Fig 2. Own material.

Fig 3. Reprinted from: <http://joyfulpublicspeaking.blogspot.com/2011/05/1993-survey-americas-number-one-fear.html>, 2011. Copyright 2011 by Richard I. Garber.

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Fig 6. Own material.

Fig 7. Own material.

Fig 8. Own material. Data retrieved from: [https://en.wikipedia.org/wiki/Stage\\_fright](https://en.wikipedia.org/wiki/Stage_fright), 2019.

Fig 9. Own material. Data retrieved from: [https://en.wikipedia.org/wiki/Stage\\_fright](https://en.wikipedia.org/wiki/Stage_fright), 2019.

Fig 10. Reprinted from: <https://www.businessinsider.com/the-htc-vive-will-be-the-best-vr-headset-2016-1?r=US&IR=T&IR=T>, 2012. Copyright 2012 Tech Insider.

Fig 11. Reprinted from: <https://ieeexplore.ieee.org/document/7833192/authors#authors>, Skarbez, R., Neyret, S., Brooks, F. P., Slater, M., & Whitton, M. C. (2017). A Psychophysical Experiment Regarding Components of the Plausibility Illusion. *IEEE Transactions on Visualization and Computer Graphics*, 23(4), 1369–1378. <https://doi.org/10.1109/TVCG.2017.2657158>

Fig 12. Own material.

Fig 13. Own material.

Fig 14. Reprinted from: <https://virtualspeech.com/>, n.d. Copyright 2019 VirtualSpeech Ltd.

Fig 15. Reprinted from: <https://www.roadtovr.com/overcoming-fears-public-speaking-speech-center-vr/>, 2016. Copyright Road to VR.

Fig 16. Reprinted from: <https://www.virtualhumantechnologies.com/2015/11/virtual-orator-announcement/>, 2015. Copyright 2015-2017 VIRTUAL HUMAN TECHNOLOGIES.

Fig 17. Reprinted from: <https://www.youtube.com/watch?v=c8GzC8YJjvs>

Fig 18. Reprinted from: <https://kotaku.com/why-gandhi-is-such-an-asshole-in-civilization-1653818245>

Fig 19. Reprinted from: <https://itunes.apple.com/us/app/goat-simulator/>

id868692227?mt=8, 2019. Copyright 2014 Coffee Stain Studios.

Fig 20. Reprinted from: <https://gamecloud.net.au/review/rick-and-morty-virtual-rick-ality>, 2017. Copyright 2019 GameCloud.

Fig 21. Reprinted from: <https://hal.inria.fr/hal-01758422/document>, Göbl, B., Hlavacs, H., Hofer, J., Müller, I., Müllner, H., Schubert, C., ... Sprung, M. (2015). MindSpace: A Cognitive Behavioral Therapy Game for Treating Anxiety Disorders in Children. In K. Chorianopoulos, M. Divitini, J. Baalsrud Hauge, L. Jaccheri, & R. Malaka (Eds.), Entertainment Computing - ICEC 2015 (pp. 463–468). Springer International Publishing.

Fig 22. Reprinted from: <https://www.behance.net/kniechwiadcd8c>

Fig 23. Reprinted from: <https://www.youtube.com/watch?v=UpeVRr-nnQg>

Fig 24. Reprinted from: <https://www.pobhattacharyya.com/projects/the-talking-dead/>

Fig 25. Reprinted from: <https://www.slashgear.com/rock-band-vr-is-coming-but-only-for-the-guitar-12439847/>

Fig 26. Own material.

Fig 27. Own material.

Fig 28. Own material.

Fig 29. Reprinted from: <https://www.hypergridbusiness.com/2016/05/altspace-vrs-event-platform-debuts-with-comedian-reggie-watts/>

Fig 30. Reprinted from: [https://store.steampowered.com/app/665360/Comedy\\_Night/](https://store.steampowered.com/app/665360/Comedy_Night/), 2017. Copyright 2017 Lighthouse Games Studio.

Fig 31. Reprinted from: <https://www.cinemablend.com/Hotel-Transylvania-2-6162.html>

Fig 32. Own material.

Fig 33. Own material.

Fig 34. Own material.

Fig 35. Own material.

Fig 36. Own material.

Fig 37. Own material.

Fig 38. Own material.

Fig 39. Own material.

Fig 40. Own material.

Fig 41. Own material.

Fig 42. Own material.

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Fig 44. Reprinted from: <https://www.octopusrift.com/setup-your-room-for-vr/>

Fig 44. Own material.

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# APPENDIX

**Initials**

**Age**

**Native language**

**Profession**

**Consent form signed by the participants:**

Any of your personal information is used only for the validation of the test data within my thesis. If I publish any of your information, it will be in an anonymized form. I will handle your information confidentially and not share it with any third party. Likewise, I will only use your photographs or video recording to analyze this test session. I will not publish any excerpts or stills without your approval.

Initials	Age	Native language	Profession
AK	32	Farsi, Dari and English	Graphic Designer
LS	26	German	Designer
AR	31	Spanish	Game Artist
IN	34	Finnish	Software Developer
BD	28	English	Performance Artist
JW	31	Finnish	Communications Assistant
HP	38	Chinese	Theatre Lighting Designer

## Pre-test questions

1. How often do you give presentations or speak to an audience?
2. Do you feel any sort of anxiety or nervousness before beginning a presentation?
  - Not at all
  - Slightly
  - Moderately
  - Very much
  - Extreme
3. What steps do you take to alleviate your stage fright before going on stage?

Initials	1	2	3
AK	Once every 3 months.	Slightly.	Drinking water and washing face before presenting.
LS	4-5 times a year.	Extreme - Especially minutes before the presenting.	Taking deep breaths minutes before presenting.
AR	Once in a week.	Slightly - Feel it with a new group of students while teaching a class.	Do nothing. Just go through it in order to experience it and become stronger for the next occasion.
IN	3-4 times a year.	Moderately - Depends on the situation and audience.	Practice speech really well.
BD	4-5 times a year.	Very much - The day before the presentation.	Repeatedly practising.
JW	5-6 times a year.	Slightly.	Become thorough with the speech material and maintain eye contact.
HP	2-3 times a year.	Not at all.	Nothing.

## Post-test questions

### Category: Stage fright

1. Were you nervous being on stage at any point of the game?
2. What would be the main difference with this approach compared to other approaches you have used earlier for alleviation?

Initials	1	2
AK	Yes - I was missing some of the speech text and attempting to catch up.	Emulating a virtual space that mimics the actual space is useful if I had to give a talk at a conference in another country.
LS	No.	Would be much better to train with the lights and stage in VR compared to my living room.
AR	Yes - The start was too sudden.	VR would be an extremely useful tool to practice repeatedly and mimic real scenarios.
IN	Yes - At the beginning of gameplay, as I did not know what to expect .	This would be more useful before presenting at conferences by preparing for the light, timing, and noise from the audience.
BD	Yes - Momentarily.	A very valuable tool to improve my public speaking skills.
JW	Yes - Some of the audience members were intimidating.	Very useful to practice in VR before conducting seminar sessions.
HP	Not really.	Quite useful in practicing clearer articulation.

### Category: Games

1. How easy or difficult was it to interact or navigate within the game?
2. How did you feel about the progression in the game?
3. What did you feel about your role and your avatar in the levels?



4. How entertaining was the gameplay?

- Not at all
- Slightly
- Moderate
- Very entertaining
- Extreme

Initials	1	2	3	4
AK	The instructions were not very clear and some parts of the game were buggy.	There was some gradual progression, but it was also abrupt at times.	The presence of the avatar made me feel like I am wearing a costume and it was light-hearted.	Slightly.
LS	Some gameplay elements were arbitrary and my role was not clear, but the tutorials added humour and lightened my mood.	Progression was smooth and not noticeable.	I did not notice my avatar since I was focused on the text.	Slightly.
AR	A certain level of detail such as enhancing the menu could make the navigation more intuitive.	It was entertaining from the beginning and I did not notice the progression.	My avatar was funny and empowering in the church scene, but it was also buggy due to poor tracking in VR.	Extreme.
IN	The instructions were not specific enough and the text recognition was slow at times.	Very abrupt.	I noticed my avatar, but it had no significance in relation to my performance.	Very entertaining.
BD	Most of the time, the navigation was smooth, but it could be improved.	Progression was gradual.	The avatar was funny and entertaining.	Extreme.
JW	It was not very difficult to play the game.	There was no progression and all the levels felt the same.	My own avatar made me feel weird.	Very entertaining.
HP	It was fairly difficult to navigate since I am new to VR.	Did not notice any progression.	The avatar made me feel stronger and powerful.	Moderate.

## Category: Phobi

1. What aspects of the Phobi did you find to be the most interesting?
2. What aspects of Phobi did not work very well?
3. Do you think a game like Phobi would help you or anyone you know to alleviate their stage fright in any manner?

Initials	1	2	3
AK	Standing on a stage in any virtual environment.	The audio was distracting and the rap song was too fast.	Yes - If it contains real spaces and real audience members as well as allows a player to upload their own speech material.
LS	Some of the speech material was funny and the tutorials lightened my mood.	There were certain spelling mistakes and the audio was too loud.	Not sure if it will help me since I get nervous only a few minutes before my presentation begins, but it could help others through practice.
AR	I felt like I was actually on stage and the humour worked really well.	Some parts of the gameplay were too sudden and abrupt, such as the rap song and the church.	Yes - If it is designed to accommodate various stages, it would help many people.
IN	I was entertained in the comedy club and amused to see the way some audience members behaved.	The instructions were pretty unclear and the rap song was too fast.	Yes - It would definitely help people when all the bugs in Phobi are fixed.
BD	Most of the game was fun and I would play it repeatedly.	The visuals seemed unfinished and could be polished even more.	Yes - It would not only help me, but would be so much fun to keep playing it.
JW	I felt very immersed throughout the game.	I would prefer to upload my own speech material and it seems uncomfortable to be reading other speeches.	Certain audience members were very intimidating, such as the bear and other predators.
HP	There was plenty of amusement and I did not think about stage fright so much.	Since it is still a prototype, it is unfinished and I noticed many bugs like the audience members walking through the chairs.	It would not be so helpful to me, but it might help others who have severe stage fright.

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